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ABSTRACT

This curriculum guide is designed to provide instruction about agriculture for eighth-grade students in Missouri. Lessons included in the curriculum employ a problem-solving instructional approach. Student-oriented activities are included to provide opportunities for experiential learning. Core competencies and key skills are identified in selected lessons to encourage teachers to enhance the attainment of those educational outcomes. A cross-reference table is included to show where the curriculum competencies relate to Missouri Core Competencies/Key Skills. A suggested teaching calendar for 6-week, 9-week, and 16-week courses and 80 references follow the table of contents. The instructor guide and the corresponding student reference contain eight units that cover the following subjects: agriculture in America, animals in society, plants in our environment, products from agriculture, environment and resource conservation, pet care, lawn care and equipment, and home environmental management. Unit outlines contain objectives, study questions, references, lesson plans, suggested activities, unit tests with answers, assignment sheets, and transparency masters. The student reference contains information sheets for each unit. (KC)

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EXPLORING AGRICULTURE IN AMERICA

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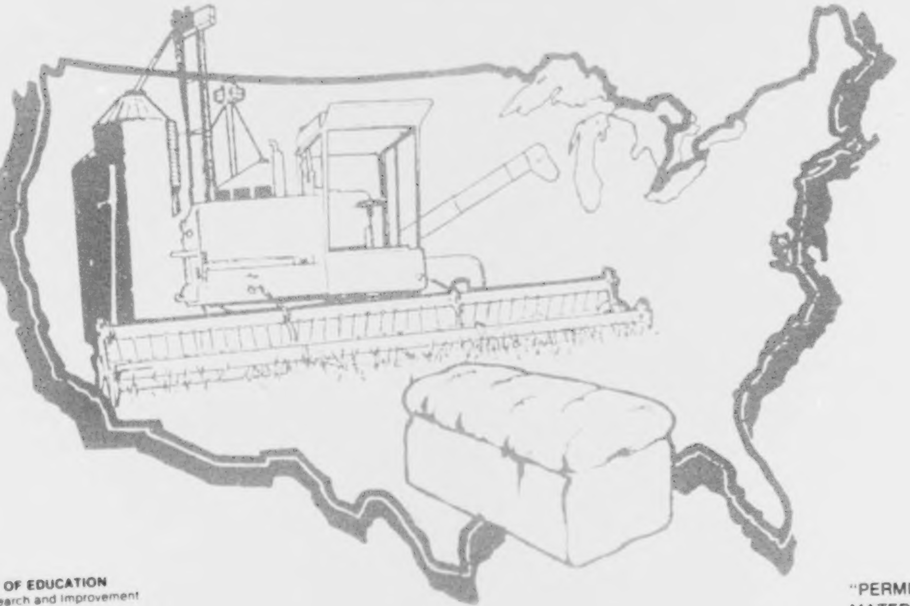

INSTRUCTOR GUIDE

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Exploring Agriculture in America

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FOREWORD

Instruction about agriculture is important for the development of an educated citizenry. Every person has a vested interest in agriculture. The future of human beings is directly dependent upon agriculture. Exploring Agriculture in America was developed to inform students about the industry which is so vital to their future.

Exploring Agriculture in America is a curriculum designed to provide instruction about agriculture for eighth grade students. Lessons included in the curriculum encompass a problem-solving instructional approach. Student-oriented activities have been included to provide opportunities for experiential learning. Core competencies and key skills have been identified in selected lessons to encourage teachers to enhance the attainment of those educational outcomes. A cross-reference table is included to show where Exploring Agriculture in America competencies relate to Missouri Core Competencies/Key Skills. A suggested teaching calendar for six-week, nine-week, and sixteen-week courses is included at the end of the table of contents.

This instructor guide and the corresponding student reference contain eight units: Agriculture in America, Animals in Society, Plants in Our Environment, Products from Agriculture, Environment and Resource Conservation, Pet Care, Lawn Care and Equipment, and Home Environmental Management.

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EXPLORING AGRICULTURE IN AMERICA

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OBJECTIVES

UNIT I - AGRICULTURE IN AMERICA

1. **The student will be able to describe the role of agriculture in America.**
2. **The student will be able to describe the role of agriculture in the growth of the U.S.**
3. **The student will be able to identify future technological advances in agriculture.**
4. **The student will be able to describe agriculture's role in the world.**
5. **The student will be able to describe agriculture in Missouri.**

UNIT II - ANIMALS IN SOCIETY

1. **The student will be able to describe the importance of animals.**
2. **The student will be able to discuss animal welfare and control regulations.**
3. **The student will be able to describe laws governing the care and control of animals.**

UNIT III - PLANTS IN OUR ENVIRONMENT

1. **The student will be able to describe how horticulture affects our lives.**
2. **The student will be able to describe the basic plant growth factors and the parts of a plant.**
3. **The student will be able to identify the important factors to consider in caring for plants.**
4. **The student will be able to explain the basic information needed to plan a garden or orchard.**

UNIT IV - PRODUCTS FROM AGRICULTURE

1. **The student will be able to describe the role of agriculture in the food chain.**
2. **The student will be able to identify the four major food groups and examples of foods in each group.**
3. **The student will be able to identify food products from plants.**
4. **The student will be able to identify foods from animals.**
5. **The student will be able to describe the importance of food processing and safety.**
6. **The student will be able to identify fibers produced from agriculture.**
7. **The student will be able to describe nonfood products from agriculture.**

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

1. The student will be able to describe the importance of conserving natural resources.
2. The student will be able to describe the causes and effects of soil erosion.
3. The student will be able to describe methods of conserving water.
4. The student will be able to describe ways to reduce air pollution in the U.S.
5. The student will be able to describe the role of wildlife in the U.S.
6. The student will be able to describe opportunities in outdoor recreation.

UNIT VI - PET CARE

1. The student will be able to identify factors to consider in selecting a pet.
2. The student will be able to describe the responsibilities in owning a pet.
3. The student will be able to identify basic health care needs of pets.
4. The student will be able to describe careers in the pet industry.

UNIT VII - LAWN CARE AND EQUIPMENT

1. The student will be able to identify the elements of a lawn care program.
2. The student will be able to describe safe practices when working with lawn mowers.
3. The student will be able to describe safe procedures for operating lawn mowers.
4. The student will be able to describe maintenance procedures of lawn mowers.
5. The student will be able to describe the safe use of power trimmers and edgers.
6. The student will be able to describe the proper care of trimmers and edgers.

UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT

1. The student will be able to discuss fire safety procedures.
2. The student will be able to explain precautions for the safe use of electricity in the home.
3. The student will be able to describe ways to conserve resources in the home.
4. The student will be able to identify common household tools.

COMPETENCIES

UNIT I - AGRICULTURE IN AMERICA

1. Describe the role of agriculture in America.
2. Describe the role of agriculture in the growth and development of the U.S.
3. Describe advances in agricultural technology and their implications.
4. Explain the role of U.S. agriculture in the world.
5. Describe agriculture in Missouri.

UNIT II - ANIMALS IN SOCIETY

1. Describe the importance of animals.
2. Discuss animal welfare and control regulations.
3. Describe laws governing the care and control of animals.

UNIT III - PLANTS IN OUR ENVIRONMENT

1. Describe how horticulture affects our lives.
2. Describe the basic plant growth factors and the parts of a plant.
3. Identify the important factors to consider in caring for plants.
4. Explain the basic information needed to plan a garden or orchard.

UNIT IV - PRODUCTS FROM AGRICULTURE

1. Describe the role of agriculture in the food chain.
2. Identify the four major food groups and examples of foods in each group.
3. Identify food products from plants.
4. Identify foods from animals.
5. Describe the importance of food processing and safety.
6. Identify fiber products from agriculture.
7. Describe the nonfood products from agriculture.

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

1. Describe the importance of conserving natural resources.
2. Describe the causes and effects of soil erosion.
3. Describe methods of conserving water.
4. Describe ways to reduce air pollution in the U.S.
5. Describe the role of wildlife in the U.S.
6. Describe opportunities in outdoor recreation.

UNIT VI - PET CARE

1. Identify factors to consider in selecting a pet.
2. Describe the responsibilities in owning a pet.
3. Identify basic health care needs of pets.

UNIT VII - LAWN CARE AND EQUIPMENT

1. Identify the elements of a lawn care program.
2. Describe the safe use of lawn mowers.
3. Describe the safe procedures for operating power lawn mowers.
4. Describe maintenance procedures of lawn mowers.
5. Describe the safe use of power trimmers and edgers.
6. Describe the proper care of edgers and trimmers.

UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT

1. Discuss fire safety procedures.
2. Explain precautions for the safe use of electricity in the home.
3. Describe ways to conserve resources in the home.
4. Identify common household tools.

REFERENCES AND MATERIALS

1. Student reference

   Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991.

2. Teacher Resources

UNIT I - AGRICULTURE IN AMERICA

1. Books, phamplets, etc.

   a. Fact Book of U.S. Agriculture. Washington, D.C., 1983.

   b. Foodcrops and Shortages. Food and Agriculture Organization of the United Nations, March 1991.

c. Krebs, Alfred H. Agriculture in Our Lives: An Introduction to Agricultural Business and Natural Resources. 5th ed. Danville, IL: Interstate Printers and Publishers, Inc., 1984.

d. McMillan, W. Feeding Multitudes: A History of How Farmers Made America Rich. Danville, IL: Interstate Printers and Publishers, 1981.

e. Missouri Agricultural Statistics Service. Missouri Farm Facts. Jefferson City, MO: Missouri Department of Agriculture, 1990.

f. Outlook for U.S. Agricultural Exports. Washington, D.C., 1990.

g. Thomas, W.T.; S.E. Curl; W.F. Bennett. Food and Fiber for a Changing World. Danville, IL: Interstate Printers and Publishers, 1982.

h. U.S. Department of Agriculture. 1986 Yearbook of Agriculture: Research for Tomorrow. Washington, D.C., 1986.

i. U.S. Department of Agriculture. 1990 Yearbook of Agriculture: Americans in Agriculture--Portraits of Diversity. Washington, D.C., 1990.

2. Audiovisuals

a. Agriculture - It's More Than You Think. video. College of Agriculture, University of Missouri-Columbia, 1989. 9 min. (available from MVRC*)

b. Agri America: 2003 A.D. video. Modern Talking Picture Service, 5000 Park St., N., St. Petersburg, FL, 33709

c. Green Cows, Quags and Mummies. video. Lowell Catlett, 1985. 37 min. (available from MVRC*)

d. Our Daily Bread - A Tribute to the American Farm. video. Florida Fruit and Vegetable Association, 1990. 19 min. (available from MVRC*)

UNIT II - ANIMALS IN SOCIETY

1. Books, phamplets, etc.

a. American Humane Society. Telephone interviews. Aug. 1990 and May 1991.

b. Animal Welfare Ordinances. Animal and Plant Health Inspection Service, U.S. Department of Agriculture., 1989.

c. Cole, H.H.; W.N. Garrett. Animal Agriculture. New York, NY: W.H. Freeman and Company, 1980.

d. Donahue, Roy L.; James E. Christiansen. Exploring Agriculture. 6th ed. Englewood Cliffs, NJ: Prentice-Hall, Inc., 1984.

e. Krebs, Alfred H. Agriculture in Our Lives. Danville, IL: The Interstate Printers and Publishers, Inc., 1984.

f. Peterson; Christiansen; Nelson. Working in Animal Science. Hightstown, NJ: McGraw Hill, 1978.

2. Audiovisuals

   a. Animal Agriculture Myths and Facts. video. Arlington, VA: Animal Industry Foundation, 1990. 18 min. (available from MVRC*)

   b. I Know What I Want. video. Straford, IA: Agri-Education, 1990. 11.45 min. (available from MVRC*)

UNIT III - PLANTS IN OUR ENVIRONMENT

1. Books, phamplets, etc.

   a. Care of Flowering Pot Plants in the Home. Champaign-Urbana, IL: University of Illinois, College of Agriculture.

   b. Plant Structures and Function of Plant Parts. College Station, TX: Texas A & M University, 1986.

   c. Reiley, Edward H.; Carrol L. Shry, Jr. Introductory Horticulture. 3rd ed. Albany, NY: Delmar Publishers, 1988.

   d. Rice, Laura Williams; Robert P. Rice, Jr. Practical Horticulture. Englewood Cliffs, NJ: A Reston Book, Prentice-Hall, 1986.

   e. University Extension agricultural guides: University of Missouri-Columbia

      1) Caring for House Plants
      2) Developing the Landscape Plan
      3) Home Fruit Spray Schedule
      4) Organic Gardening Techniques
      5) Vegetable Harvest and Storage

   f. U.S. Department of Agriculture, Environmental Protection Agency. Apply Pesticides Correctly. Washington, D.C.: U.S. Government Printing Office.

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2. Audiovisuals

   a. How to Design and Build a Vegetable Garden. video. IN: Kartes Video Communications Entertainment, 1986. 53 min. (available from MVRC*)

   b. Plant Propagation Vol. I. video. Vocational Education Productions, 1987. (available from MVRC*)

   c. Plant Propagation Vol. II. video. Vocational Education Productions, 1987. (available from MVRC*)

UNIT IV - PRODUCTS FROM AGRICULTURE

1. Books, phamplets, etc.

   a. Cooper, Elmer L. Agriscience Fundamentals and Applications. Albany, NY: Delmar Publishers Inc., 1990.

b. Food for America. Program of the National FFA Organization sponsored by Mobay Corporation, Agricultural Chemicals Division as a special project of the National FFA Foundation

c. Foodthought - Information on Food Safety and the Environment. Washington, DC: National Council of Farmer Cooperatives, 1990.

d. Introduction to Agricultural Products and Processing. Stillwater, OK: Curriculum and Instructional Materials Center, 1990.

e. Mehas, Kay Y.; Sharon L. Rodgers. Food Science and You. Mission Hills, CA: Glencoe Publishing Company, 1989.

2. Audiovisuals

a. The Challenge of Choice--Milk Marketing in the 1990s. video. Wisconsin Milk Marketing Board. 1990. 11 min. (available from MVRC*)

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

1. Books, phamplets, etc.

a. America's Soil and Water Condition and Trends. United States Department of Agriculture, Soil Conservation Service. 1980, revised 1981.

b. Bennett, Charles F. Conservation and Management of Natural Resources in the United States. New York, NY: John Wiley and Sons, 1983.

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d. Conserving Soil. National Association of Conservation Districts, U.S. Soil Conservation Service, USDA, nd.

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g. Lesko, Matthew. Information USA. Revised edition. Viking Pequin Books, 1986.

h. Missouri Department of Natural Resources Groundwater Protection Curriculum Guide, nd.

i. Renewable Energy At the Crossroads. Washington, D.C.: Center for Renewable Resources, nd.

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l. Troeh, Frederick R.; Arthur J. Hobbs; Roy L. Donahue. Soil and Water Conservation: For Productivity and Environmental Protection. Englewood Cliffs, NJ: Prentice-Hall, 1980.

m. Whitnah, Donald R. The Greenwood Encyclopedia of American Institutions. Westport, CT: Greenwood Press, 1983.

2. Audiovisuals

   a. Dedicated to Conservation II. video. Missouri Department of Conservation. 15 min. (available from MVRC*)

   b. The Groundwater on the Move. video. IA: Department of Natural Resources. 15 min. (available from MVRC*)

   c. Guarding Our Living Environment. video. Missouri Department of Conservation, 1983. 26 min. (available from MVRC*)

   d. Keeping Groundwater Clean. video. Community Relations, Deere and Company, John Deere Road, Moline, IL, 61265. 5.45 min.

   e. Missouri Groundwater: The Hidden Resource. video. MO: Department of Natural Resources. 17 min. (available from MVRC*)

   f. Stream Sense. video. Missouri Department of Conservation. 19 min. (available from MVRC*)

   g. Time Shadows: Encounters with the Whitetail. video. Missouri Department of Conservation, 1987. 24 min. (available from MVRC*)

UNIT VI - PET CARE

1. Books, phamplets, etc.

   a. Central Missouri Humane Society. Telephone interviews. Columbia, MO. Aug. 1990 and June 1991.

   b. How to Select Your Four-Footed Friends. Chicago, IL: Pets are Wonderful Council, 1982.

   c. Peterson; Christenson; Nelson. Working in Animal Science. New York, NY: McGraw-Hill, 1978.

   d. Pets are Wonderful Family Members. Chicago, IL: Pets are Wonderful Council, 1982.

   e. Rhodes, John D. Giving or Receiving Pets--an Owner's Responsibility. Columbia, MO: University Extension, 1977.

   f. Summer Pet Care. Columbia, MO: Central Missouri Society, n.d.

2. Audiovisuals

   a. Beginner's Guide to Buying a Horse. filmstrip. Vocational Education Productions, 1979. (available from MVRC*)

   b. Small Animal Care: Dogs. filmstrip. Vocational Education Productions, 1979. (available from MVRC*)

UNIT VII - LAWN CARE AND MAINTENANCE

1. Books, phamplets, etc.

   a. Colvin, Thomas S. Operating Tractors for Grounds Keeping and Ornamental Horticulture. Athens, GA: American Association for Vocational Instructional Materials, 1974. (available from the Instructional Materials Laboratory)

b. Herd, Amon. Operating and Storing Small Engines. University of Missouri-Columbia: Instructional Materials Laboratory.

c. Lawn, Garden and Power Equipment. (Owner's Manual) Overland Park, KS: Intertec Publishing Corporation, 1985.

d. Operating Mowers for Grounds Keeping and Ornamental Horticulture. Athens, GA: American Association for Vocational Instructional Materials. (available from the Instructional Materials Laboratory)

e. Outdoor Power Equipment Repair. Stillwater, OK: Mid-America Vocational Curriculum Consortium, Inc., 1985. (available from the Instructional Materials Laboratory)

f. Safe Mowing is Better Mowing. Slide Set and Script. U.S. Consumer Product Safety Commission, Washington, D.C. 20207.

g. String Trimmer. (Service Manual) 1st ed. Overland Park: KS, Intertec Publishing Corporation.

2. Audiovisuals

a. Growing Beautiful Lawns. video. CA: Ortho, 1987. 60 min. (available from MVRC*)

UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT

1. Books, phamplets, etc.

a. Fire Extinguishers: Your Small-Fire Defense. Quincy, MA: National Fire Protection Association.

b. Henderson, G.E.; Robert H. Brown. Home Electrical Repair. 6th ed. Athens, GA: American Association for Vocational Instructional Materials, 1987.

c. Henderson, G.E. Understanding Electricity and Electrical Terms. 6th ed. Athens, GA: American Association for Vocational Instructional Materials, 1986.

d. Play It Safe--Plan Your Escape. Quincy, MA: National Fire Protection Association.

e. Your House is on Fire. Aetna Life and Casualty, Booklet.

2. Audiovisuals

a. Understanding Electricity and Electricity Terms, 80 slides with script. Athens, GA: American Association for Vocational Instrucation Materials. (available from the Instructional Materials Laboratory)

*These resources are available to Missouri residents through the Missouri Vocational Resource Center (MVRC), University of Missouri-Columbia, 10 London Hall, Columbia, MO 65211. (800-392-7217)

Cross Reference Table

Exploring Agriculture in America Competencies	Missouri Core Competencies/Key Skills			
	English/ Language Arts	Mathematics	Science	Social Studies/Civics
UNIT I - AGRICULTURE IN AMERICA				
1. Describe the role of agriculture in America.				8N-1, 8R-6
2. Describe the role of agriculture in the growth and development of the U.S.				7F-9, 8F-9, 8M-4, 8N-4
3. Describe advances in agricultural technology and their implications.				
4. Explain the role of U.S. agriculture in the world.	7D-2, 8D-2			7M-1, 8M-1
5. Describe agriculture in Missouri.				
UNIT II - ANIMALS IN SOCIETY				
1. Describe the importance of animals.				
2. Discuss animal welfare and control regulations.	7C-2, 7K-2, 7K-4, 8C-2, 8K-2, 8K-4			7K-2, 7L-1, 8K-2, 8L-1, 8Q-5
3. Describe laws governing the care and control of animals.	7K-2, 8K-2			7K-2, 7L-1 8K-2, 8L-1
UNIT III - PLANTS IN OUR ENVIRONMENT				
1. Describe how horticulture affects our lives.				
2. Describe the basic plant growth factors and the parts of a plant.				
3. Identify the important factors to consider in caring for plants.				
4. Explain the basic information needed to plan a garden or orchard.				
UNIT IV - PRODUCTS FROM AGRUCULTURE				
1. Describe the role of agriculture in the food chain.				

Exploring Agriculture in America Competencies	Missouri Core Competencies/Key Skills			
	English/ Language Arts	Mathematics	Science	Social Studies/Civics
2. Identify the four major food groups and examples of foods in each group.				
3. Identify food products from plants.				
4. Identify foods from animals.				
5. Describe the importance of food processing and safety.	7D-5, 8D-5	8G-4		8Q-5
6. Identify fiber products from agriculture.				
7. Describe the nonfood products from agriculture.				
UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION				
1. Describe the importance of conserving natural resources.			8D-3, 8K-2	7B-1, 8B-1
2. Describe the causes and effects of soil erosion.	7C-3, 8C-3		8D-4	
3. Describe methods of conserving water.			7C-5, 7G-3, 8D-4	
4. Describe ways to reduce air pollution in the U.S.			8D-4	
5. Describe the role of wildlife in the U.S.			8D-3	
6. Describe opportunities in outdoor recreation.	7D-2, 7E-1, 8D-2, 8E-1			7A-1, 8A-1
UNIT VI - PET CARE				
1. Identify factors to consider in selecting a pet.	8G-12			
2. Describe the responsibilities in owning a pet.		8B-6		
3. Identify basic health care of pets.				

Exploring Agriculture in America Competencies	Missouri Core Competencies/Key Skills			
	English/ Language Arts	Mathematics	Science	Social Studies/Civics
UNIT VII - LAWN CARE AND EQUIPMENT				
1. Identify the elements of a lawn care program.				
2. Describe the safe use of lawn mowers.				
3. Describe the safe procedures for operating power lawn mowers.				
4. Describe maintenance procedures of lawn mowers.				
5. Describe the safe use of power trimmers and edgers.				
6. Describe the proper care of edgers and trimmers.				
UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT				
1. Discuss fire safety procedures.		8G-4		
2. Explain precautions for the safe use of electricity in the home.				
3. Describe ways to conserve resources in the home.	7C-5, 8C-5			
4. Identify common household tools.		8D-6, 8H-3		

Note: The Core Competencies and Key Skills are printed in the 1990 Core Competencies and Key Skills for Missouri Schools by the Missouri Department of Elementary and Secondary Education. This publication is available from the Center for Educational Assessment, College of Education, University of Missouri-Columbia, 403 S. 6th street, Columbia, MO 65211.

SUGGESTED TEACHING CALENDAR

(in days, 1 period per day)

UNIT	6 Weeks	9 Weeks	18 Weeks
Agriculture in America	9	10	15
Animals in Society	5	5	8
Plants in Our Environment	7	10	13
Products from Agriculture	9	10	15
Environment and Resource Conservation	XXXX	10	15
Pet Care	XXXX	XXXX	9
Lawn Care and Maintenance	XXXX	XXXX	10
Home Environmental Management	XXXX	XXXX	5
TOTAL	30 days	45 days	90 days

NOTE: No time is allotted for lost days due to testing, assemblies, etc.

UNIT I - AGRICULTURE IN AMERICA

Lesson 1: Agriculture in America

Objective: The student will be able to describe the role of agriculture in America.

Study Questions

1. **What is agriculture?**
2. **How important is agriculture in America?**
3. **Why does agriculture vary across the U.S.?**
4. **How important is American agriculture to other nations?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit I.
2. Activity Sheet
   - a) AS 1.1: Origin of Food Products

UNIT I - AGRICULTURE IN AMERICA

Lesson 1: Agriculture in America

TEACHING PROCEDURES

A. Introduction

This lesson presents a broad definition of the term agriculture. In the process of defining the term, students will have an opportunity to examine the role of agriculture in America.

B. Motivation

Bring to class samples of the following foods: a hamburger, french fries, milk shake, grapes, apples, raisins, bread, cheese, etc.

1. Dissect the hamburger and have students identify the agricultural commodities that are used to produce each product, and/or

2. Have students identify which states produce these foods and the agricultural commodities that are needed to produce the food products listed on AS 1.1.

These lists can be turned in or presented orally. The student that identifies the most states or countries may be given a food item of his or her choice to eat. This can be continued until all the food is gone.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is agriculture?

A1. Agriculture is defined as all activities involved in the production, processing, distribution, and marketing of food and fiber products.

In the early history of the U.S., farmers strived to produce enough food for their families and to trade to neighboring townspeople. In today's society, the basic concept of producing food has not changed, but agriculture has.

Q2. How important is agriculture in America?

A2.
a) American agriculture feeds the nation and many parts of the world.
b) Largest industry in the U.S.
c) Employs over 20 million people
d) Consumers spent $444.5 billion (16.2 percent of their disposable income) on food produced in the U.S.
e) Agricultural research has helped solve human health and nutrition problems.

Agriculture affects everyone each and every day. People cannot survive for long periods of time without food. Agriculture is the industry involved in producing food, fiber, and other important products. Agriculture employees are involved in transporting, processing, storing, and merchandising the output of the nation's farms. Agriculture provides over 20 million jobs in the U.S., almost one of every five jobs in private enterprise.

Q3. Why does agriculture vary across the U.S.?

A3. The optimum environmental conditions vary among different plants and animals.

a) Soil conditions (topography, fertility)
b) Length of the growing season
c) Amount of rainfall
d) Temperature extremes
e) Animal production is located where feedstuffs are available.

The U.S. is the top food and fiber producing nation in the world. However, there are limitations on the products that can be produced in some areas. The production of food and fiber crops depends on climatic conditions, natural resources, and other factors. Livestock production is also concentrated in areas with favorable environmental conditions (e.g., adequate feed and water and moderate temperatures).

Q4. How important is American agriculture to other nations?

A4. Many foreign countries are dependent on the U.S. to supply the food needed to feed their citizens.

The U.S. has sufficient resources to produce nearly all of the food needed to feed its population. Other countries are less fortunate and buy food produced in the U.S. to feed their people. In 1989, the U.S. exported the following commodities measured in million metric tons (MMT) One metric ton = 2,200 pounds. Note: One railroad car holds approximately 240,000 lbs, or 110 metric tons.

Wheat - 37.747 MMT
Coarse grains (corn, oats, barley, sorghum, and rye) - 60.448 MMT
Rice - 3.048 MMT
Soybeans - 14.115 MMT

Some of the areas that import U.S. agricultural products are:

Western Europe
Eastern Europe
USSR
Asia - Japan, China, Taiwan, South Korea, Pakistan, Philippines
Middle East - Iraq, Saudi Arabia
Africa - North Africa, Egypt, Algeria, Sub-Saharan Africa
Latin America - Mexico, Brazil, Venezuela
Canada
Oceania

In addition to exports, the U.S. operates the world's largest food aid program by shipping millions of tons of food each year to over 70 foreign countries for free or at a reduced cost.

F. Other activities

1. Show the video Agriculture - It's More Than You Think available from the Missouri Vocational Resource Center.

2. Show the video Agri America: 2003 A.D. It is available from Modern Talking Picture Service, 5000 Park St., N., St. Petersburg, FL, 33709.

G. Conclusion

Agriculture is the industry that produces food and fiber products. The agricultural industry in the U.S. is the country's largest employer. Products produced in agriculture vary from state to state. Many foreign countries depend on U.S. agriculture to help supply their food needs.

H. Competency

Describe the role of agriculture in America.

Related Missouri Core Competencies and Key Skills:

8N-1: Predict likely consequences in costs and/or benefits to an industry or nation when changes occur in one or more factors of production.
8R-6: Identify, with concrete examples from U.S. history, consequences (costs and benefits) of economic interdependence among regions.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 1.1 - Origin of Food Products

Answers are on the following page.

FOOD ITEM	AGRICULTURAL PRODUCT	STATE
Corn flakes	corn	Iowa, Illinois, Indiana, Missouri
Orange juice	oranges	California, Florida, Texas
Cottage cheese	milk	Wisconsin, Minnesota, New York, Missouri
Bread	winter wheat	Missouri, Kansas, Oklahoma, North Dakota, South Dakota
Ketchup	tomatoes	Pennsylvania, Ohio, California
Raisins	grapes	California
Spaghetti	Durham wheat	Washington, Oregon, Idaho
Hamburger	beef	Missouri, Kansas, Iowa, Texas, Oklahoma
Sugar	sugar cane and sugar beets	California, Idaho, Colorado, Hawaii
Rice	rice	Missouri, Louisiana, Mississippi, Alabama
Chicken nuggets	poultry	Georgia, Missouri, Texas, Arkansas
Pepperoni	pork	Iowa, Missouri, Illinois, Indiana, South Carolina

Lesson 1: Agriculture in America

Name ____________

ORIGIN OF FOOD PRODUCTS

Objective: The student will be able to identify where selected foods come from.

Using the list of food items presented below, identify the raw agriculture product used to make the item. Also, identify a state where it may have been produced.

FOOD ITEM	AGRICULTURAL PRODUCT	STATE
Corn flakes		
Orange juice		
Cottage cheese		
Bread		
Ketchup		
Raisins		
Spaghetti		
Hamburger		
Sugar		
Rice		
Chicken nuggets		
Pepperoni		

Lesson 2: Development of Agriculture in America

Objective: The student will be able to describe the role of agriculture in the growth of the U.S.

Study Questions

1. **How did agriculture help the U.S. grow?**
2. **What were some early advancements in agriculture?**
3. **How did these advancements help American citizens?**
4. **What USDA government programs provide food assistance for families?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit I.
2. Transparency Master
    - a) TM 2.1: Modern Agricultural Implements

Lesson 2: Development of Agriculture in America

TEACHING PROCEDURES

A. Review

The agricultural industry in the U.S. is the country's largest employer. It provides food and fiber products for U.S. consumers and other countries. This lesson will discuss the advancements in agricultural practices that have had a positive effect on the U.S. and the lives of its people. Advances in production, transportation, and storage of food and fiber products have freed the majority of U.S. citizens to pursue other careers.

B. Motivation (Select one.)

1. Bring to class several hand tools that are commonly used in gardening. Show the tools to the class and explain how they were used as early farm implements. Discuss how the transformation from human power to animal power to machine power has helped change the U.S.

2. Show the video Our Daily Bread available from the Missouri Vocational Resource Center.

C. Assignment

D. Supervised study

E. Discussion

Q1. How did agriculture help the U.S. grow?

A1. Agricultural production efficiency has freed people to pursue other careers.

Agricultural advancements have changed the lives of citizens of the U.S. Before the American Revolution, the ability to produce abundant food and other agricultural products allowed America to seek independence. Westward expansion in America was prompted by the need to secure more land for farming and ranching to feed a growing U.S. population. Westward expansion also created the need for transcontinental railroads to move agricultural products throughout the U.S. Because of the efficiency of American farmers, other citizens are able to pursue careers in other fields.

Q2. What were some early advancements in agriculture?

A2.
- **a) Cotton gin (1793)**
- **b) Mechanical harvester (1833)**
- **c) Commercial fertilizer (1849)**
- **d) Morrill Act (1862)**
- **e) Steel plow**
- **f) Gasoline-powered tractor**
- **g) Mechanical cotton picker (1927)**
- **h) New crops**
- **i) Crop rotation**

Show TM 2.1 to illustrate modern implements used in agriculture.

Q3. How did these advancements help American citizens?

A3.
- a) **Abundance of nutritious foods**
- b) **Quality food**
- c) **Low-cost food**
- d) **Year-round availability of food**
- e) **Improved human health and nutrition**
- f) **More people are employed in agriculture.**

Ask students how these advancements helped American citizens. Without these technological advancements, the food supply would be smaller, of lower quality, and more expensive.

Q4. What USDA government programs provide food assistance for families?

A4.
- a) **Food Stamp Program**
- b) **Surplus commodity distribution program**
- c) **WIC (Women, Infants, and Children) Nutrition Program**
- d) **School Lunch Program**
- e) **School Breakfast Program**

The U.S. Department of Agriculture (USDA) conducts several programs designed to improve the nutrition and health of American citizens. Many surplus agricultural products are provided to needy residents for free or at a reduced cost.

F. Other activities

1. Have a representative from a local farm machinery dealership explain the history and development of machines used in agriculture. Ask the representative to talk about the changes that have taken place in the company. Videos are available from many companies.

2. Have students research and report on the role of agriculture in the westward expansion of the U.S.

3. Develop a list of early inventions in agriculture and have students do oral reports on the topic.

G. Conclusion

Agriculture has contributed much to the growth and development of the U.S. Before the American Revolution, the American colonies were becoming less and less dependent on Europe. The growing independence of the colonies was made possible by America's ability to produce food and other agricultural products needed to survive. Agriculture continues to enable the U.S. to be independent.

H. Competency

Describe the role of agriculture in the growth and development of the U.S.

Related Missouri Core Competencies and Key Skills:

7F-9: Explain relationships among factors that have caused specific changes in the histories of cultures studied.

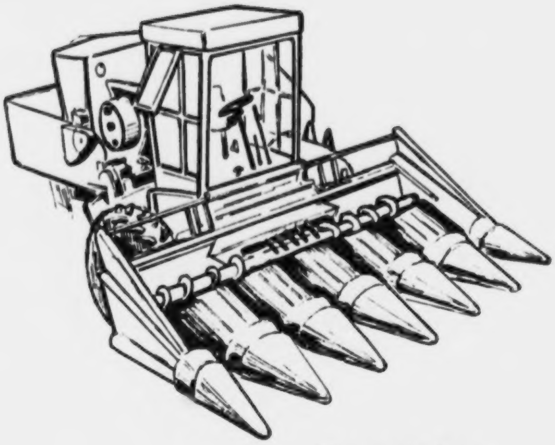
8F-9: Explain relationships among factors that have caused specific changes in the histories of cultures studied.
8M-4: Identify social consequences of economic decisions.
8N-4: Identify major current and historical changes that have led to economic growth over time.

I. Evaluation

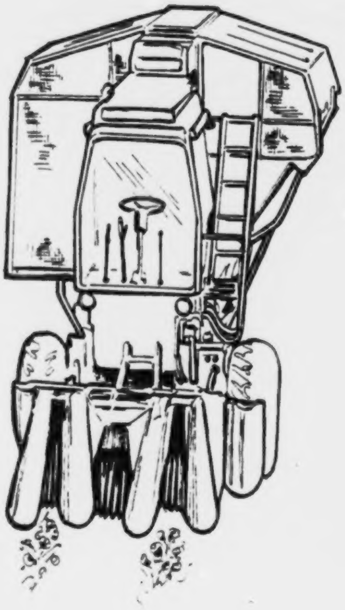
A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

TM 2.1

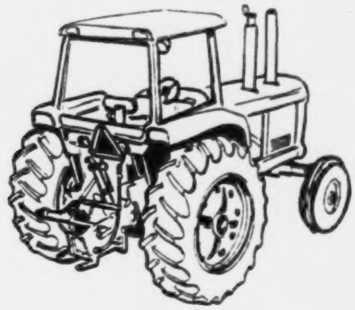
Modern Agricultural Implements



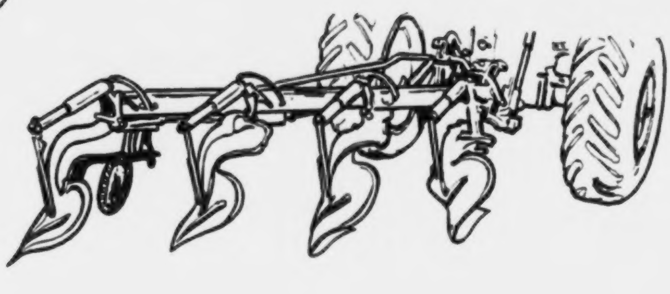
Combine



Cotton Picker



Tractor



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UNIT I - AGRICULTURE IN AMERICA

Lesson 3: Agriculture in the Future

Objective: The student will be able to identify future technological advances in agriculture.

Study Questions

1. **What is the goal of agriculture in America?**
2. **What are some recent advancements in agriculture?**
3. **How will agriculture change in the future?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit I.
2. Activity Sheet
    a) AS 3.1: Embryo Cloning

TEACHING PROCEDURES

A. Review

Agriculture is a diverse industry. Many discoveries have been made in recent years that keep American agriculture on the leading edge of technology. There is a bright future for agriculture in America and for the people of this nation and the world. In this lesson, breakthroughs in agricultural technology and their effects on food and fiber production will be discussed.

B. Motivation (Select one.)

1. Using a microwave, cook two kinds of hot dogs, cut them into pieces and have the students sample each. One package should be "all-beef" hot dogs. The other package should be made of turkey, chicken, or soybean products. Conduct a taste test to see which kind students prefer. Explain the differences in the cost of the two products.

2. Pass out small, individual boxes of raisins to each student. While they eat the raisins, ask them to guess how much time it takes to process grapes into raisins. They should estimate the time needed to dump the product into the hopper, de-stem, sort by size and quality, wash, dry, package, and stack the containers. Write the students' answers on the board. The correct answer is 8 minutes. Show the video Green Cows, Quags and Mummies available from the Missouri Vocational Resource Center. Discuss how technology will affect the production and marketing of food products in the future.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is the goal of agriculture in America?

A1. To produce food and fiber products and renewable energy resources

Agriculture produces food and fiber products for a growing world population. In addition, agriculture produces products for energy use to replace the depleting supply of fossil fuels. Continued work through research will be needed to produce more nutritious food products. Researchers will also continue to develop plant species that will grow in different environments. Have students complete AS 3.1. and discuss their reports.

Q2. What are some recent advancements in agriculture?

A2.
- **a) Use of biotechnology**
  - **1) Genetic changes in plants**
  - **2) Genetic changes in animals**
- **b) Mechanical**
  - **1) Electronic monitoring**
  - **2) Hydraulics**

        - 3) **Lasers**
        - 4) **Robotics**
    - c) **Integrated pest management**

Advancements in agricultural research continue to change America.

Q3. How will agriculture change in the future?

A3.
- a) **More efficient machinery**
- b) **Alternative uses of agricultural products**
- c) **More use of computers and electronic monitors**
- d) **Increased world trade**
- e) **Use of pest-resistant plants**
- f) **Less use of pesticides**
- g) **More efficient animals**

Technology has increased the production efficiency of American farmers. New methods, equipment, and techniques have been developed to improve the quantity or quality of agricultural production. Some of the technology is very expensive and must be modified before it can be adopted in agriculture.

F. Other activities

1. Invite a veterinarian to class to discuss advances in animal health care.

2. Conduct a class experiment on hydroponics, growing plants in nutrient solutions without soil.

3. Have students do research papers on biotechnology.

4. Have students write an essay on what their town will be like in 50 years.

G. Conclusion

Agriculture has become a much more complex and highly technical industry in recent years. Advancements in science and technology have been adapted to agriculture in a variety of ways. With an expanding world population, the demand for food and fiber products is expected to increase. Agriculture must utilize technological advancements to increase productivity to meet the world's food and fiber needs. Renewable energy resources produced in agriculture are expected to become more important in the future.

H. Competency

Describe advances in agricultural technology and their implications.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 3.1 - Embryo Cloning

The instructor will need to determine if answers are appropriate.

Lesson 3: Agriculture in The Future Name ____________________

EMBRYO CLONING

Objective: The student will be able to describe the advantages and disadvantages of embryo cloning in animal production.

Situation: Scientific advances have enabled researchers to clone animal embryos to produce genetically identical offspring in cattle. Each young calf produced from a cloned embryo would grow and mature exactly like all other calves cloned from the same embryo. This technology is expensive, but is being developed to the point where it can be used in commercial agriculture.

Problem: The world population is increasing, which requires that food production also increase. Cloning of meat producing animals may increase the ability of farmers to produce high quality beef in a consistent manner.

Assignment: In two to three paragraphs, describe the advantages and disadvantages of using embryo cloning in animal production.

UNIT I - AGRICULTURE IN AMERICA

Lesson 4: U.S. Agriculture in the World

Objective: The student will be able to describe agriculture's role in the world.

Study Questions

1. **What is the role of agriculture in the world?**
2. **How does U.S. agriculture assist other countries?**
3. **What is the future of U.S. agricultural products in the world?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit I.
2. Transparency Master
    a) TM 4.1: Food Deficit Countries
3. Activity Sheets
    a) AS 4.1: International Auction (Instructor)
    b) AS 4.1: International Auction (Student)

Lesson 4: U.S. Agriculture in the World

TEACHING PROCEDURES

A. Review

In the future, agriculture must utilize technological advancements to increase production to meet the world's food and fiber needs. This lesson examines the role of U.S. agriculture in the world. America has been called "the land of plenty," and because American farmers have done an outstanding job of increasing food crop production, U.S. agriculture is able to provide a variety of products to other countries.

B. Motivation

Have an international auction using AS 4.1. (Some preparation needs to be done before class.)

C. Assignment

D. Supervised study

E. Discussion

Q1. What is the role of agriculture in the world?

A1. a) Provide food, clothing, and shelter
b) Provide income for other purchases

The survival of many countries is dependent upon the products of other countries. Agricultural products play an important role in the world economy. U.S. agriculture also provides support for many developing nations. Use TM 4.1 to point out the countries that do not produce enough food to feed themselves. Some countries exports agricultural products in order to get money needed to buy products they are not able to produce. Note that some countries export food products in order to buy weapons or other military equipment.

Q2. How does U.S. agriculture assist other countries?

A2.
- **a) Provide food**
  - **1) Export**
  - **2) Foreign aid**
  - **3) Disaster relief**
- **b) Assist with food production/storage techniques**
- **c) Education about new technologies**

The world population continues to increase. It is estimated that 85 percent of all the babies born in the world begin life in countries that are underdeveloped. These countries are often not able to produce enough food to feed themselves.

Q3. **What is the future of U.S. agricultural products in the world?**

A3. **a) Demand for food will increase**
b) Desire for higher quality diets in developing countries
c) Food supplies will vary depending on:
  1) Weather or natural disaster
  2) Government policies
  3) Transportation and storage facilities
  4) Technological advances

In 1980, less than four percent of the U.S. population was employed on ranches and farms. The percentage is expected to continue to decline in the 1990s. However, the population of the world continues to grow at the rate of nearly 80 million people each year. The demand for food is expected to increase in direct proportion to a growing world population.

F. Other activities

1. Ask students to make recommendations for feeding the growing world population, recognizing there are limits to agricultural productivity in the world.

2. Conduct a mock United Nations session to develop a world food and agriculture policy for the year 2000. Assign students to various countries from the super powers to some underdeveloped nations.

G. Conclusion

The U.S. plays a large role in providing food for the world. The U.S. works with other countries by providing food and education. American agriculture continues to work toward the goal of helping developing countries become self sufficient.

H. Competency

Explain the role of U.S. agriculture in the world.

Related Missouri Core Competencies and Key Skills:

7D-2: Use graphic sources for information: pictures, maps, graphs, time lines, charts, diagrams, tables, schedules, etc.
7M-1: Give examples of people, businesses, or government entities having to make choices because of circumstance of scarcity.
8D-2: Use graphic sources for information: pictures, maps, graphs, time lines, charts, diagrams, tables, schedules, etc.
8M-1: Give examples of people, businesses, or government entities having to make choices because of circumstance of scarcity.

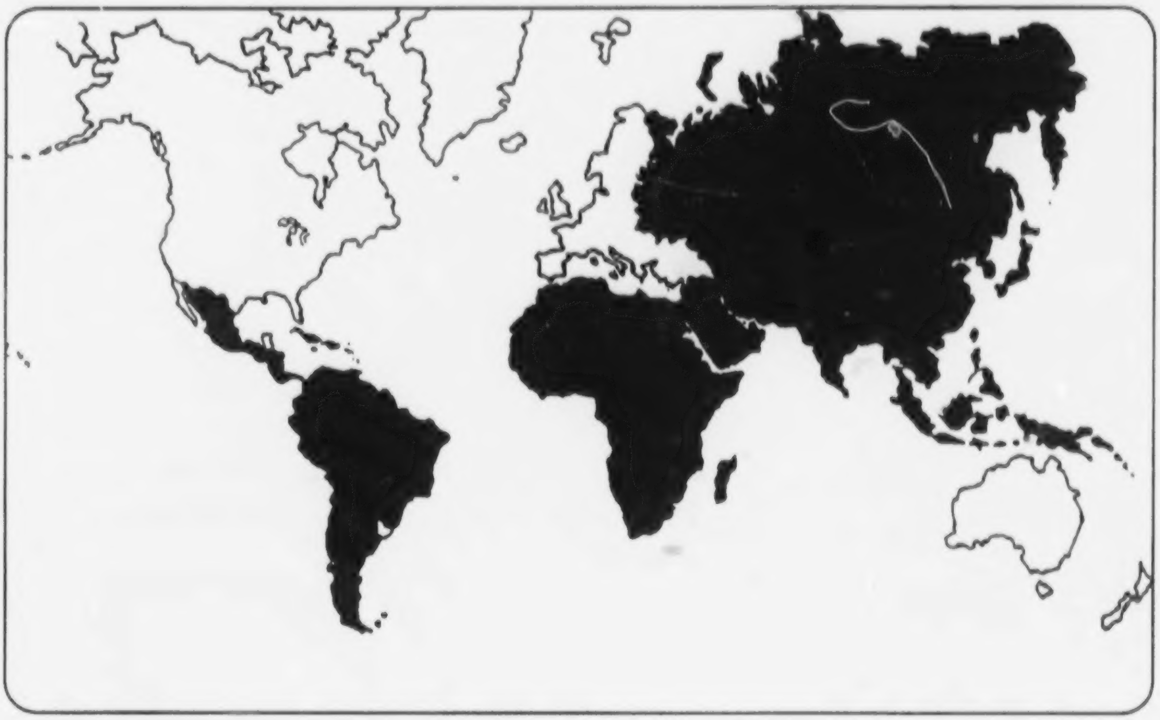
I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 4.1 - International Auction

This activity is for discussion purposes only.

Food Deficit Regions of the World



■ Indicates Regions with Deficits

INTERNATIONAL AUCTION

Before class begins, copy five pages of "food product" coupons and five pages of "other product" coupons. Cut out the coupons.

Divide the class into groups of 3 or 4 students. Assign each group to represent a country from the list provided below. Provide each group with the amount of money indicated, which is the amount of money available to buy agricultural products on the world market. Tell each group how much money they have available and how many food coupons they need to purchase to feed the country's population. Distribute a copy of AS 4.1 (Student) to each group (country) to record its purchases.

Each group should purchase the food first; additional products may be purchased if the amount of food is adequate. Have each group report its position after all trading has been completed.

Country	Units of Food Needed	Funds Available
USA	1	$50 billion
England	1	$10 billion
France	1	$10 billion
Australia	1	$10 billion
USSR	5	$20 billion
China	10	$10 billion
India	15	$10 billion
Japan	5	$30 billion
Ethiopia	10	$5 billion
Saudi Arabia	5	$40 billion

Conduct an auction, beginning with the food product coupons until each group (country) has spent all of its money or does not wish to make any more purchases. At the end of the auction, have each group explain what was purchased and how much money is left over.

Students should be guided to the conclusion that some countries lack sufficient resources to raise or purchase the food needed to feed their people. Other countries are wealthy enough to supply the food and also to purchase other products to improve the quality of life for their citizens. Also, note that countries with a large amount of funds available usually get those funds by exporting other products. Countries with limited funds usually have fewer products that they can sell as exports.

FOOD PRODUCT COUPONS

Food Products $1 Billion	Food Products $1 Billion
Food Products $1 Billion	Food Products $1 Billion
Food Products $1 Billion	Food Products $1 Billion
Food Products $1 Billion	Food Products $1 Billion
Food Products $1 Billion	Food Products $1 Billion
Food Products $1 Billion	Food Products $1 Billion

OTHER PRODUCT COUPONS

Automobiles $2 Billion	Crude Oil $2 Billion
Electronic Equipment $3 Billion	Military Aircraft $3 Billion
Medicine $1 Billion	Tractors $1 Billion
Lumber $1 Billion	Steel $1 Billion
Airplanes $3 Billion	Agricultural Equipment $1 Billion
Shoes $1 Billion	Clothing $1 Billion

Lesson 4: U.S. Agriculture in the World

Name ________________

INTERNATIONAL AUCTION

Objective: The student will gain a better understanding of how funds available to purchase agricultural products on the world market affect food distribution.

Fill in the blanks as indicated. As purchases are made, record what was purchased and how much was spent on each purchase.

Country ________________________________

Food Units Needed ________________________

Funds Available $________________________

UNITS PURCHASED	FUNDS SPENT
Ending Balance:	$

Were you able to purchase enough food to feed your country? Why or why not?

UNIT I - AGRICULTURE IN AMERICA

Lesson 5: Agriculture in Missouri

Objective: The student will be able to describe agriculture in Missouri.

Study Questions

1. **How important is agriculture in Missouri?**
2. **How does Missouri compare to other states in agricultural production?**
3. **How may Missouri agriculture change in the future?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit I.
2. 1990 Missouri Farm Facts, Missouri Department of Agriculture. (Teacher only) *The instructor should obtain the most current edition.
3. Transparency Master
   a) TM 5.1: 1989 Missouri's General Ranking
4. Handout
   a) HO 5.1: 1988 Cash Receipts
5. Activity Sheet
   a) AS 5.1: Agricultural Commodities Produced in Missouri

Lesson 5: Agriculture in Missouri

TEACHING PROCEDURES

A. Review

Agriculture is a major industry in the U.S. Agricultural products provide food for U.S. consumers and are exported to several foreign countries. Agriculture is also an important industry in the State of Missouri.

B. Motivation

Poll the students on what agricultural products are raised in the state. Make a list on the board and discuss the products. Ask students to identify where the production of each commodity is concentrated in the state. Have students complete AS 5.1 using copies of Missouri Farm Facts or through large group discussion.

C. Assignment

D. Supervised study

E. Discussion

Q1. How important is agriculture in Missouri?

A1. a) **$4 billion of agricultural products are produced in Missouri each year.**
b) **Agriculture is the largest employer in Missouri.**
c) **There were more than 108,000 Missouri farms in 1989.**

Missouri produces a variety of crops and other agricultural products. Ask the class to identify products grown in Missouri. Write them on the board and discuss them. Use HO 5.1 to identify Missouri counties where crop and livestock production are concentrated. (The instructor should update the handout using the most current Missouri Farm Facts.)

Q2. How does Missouri compare to other states in agricultural production?

A2. a) **Beef cattle and calves - 2nd**
b) **Hay - 2nd**
c) **Winter wheat - 4th**
d) **Grain sorghum (milo) - 4th**
e) **Turkeys - 5th**
f) **Hogs and pigs - 6th**
g) **Soybeans - 6th**
h) **Rice - 6th**
i) **Concord grapes - 6th**
j) **American cheese - 7th**
k) **Corn - 9th**
l) **Butter - 9th**
m) **Cotton - 10th**
n) **Milk - 11th**

o) **Eggs - 13th**
p) **Red meat - 13th**
q) **Chickens - 14th**

Ask the class for ideas on where Missouri ranks in the production of agricultural commodities as compared to other states. Write their answers on the board and discuss them. Use TM 5.1. The instructor could update the information on TM 5.1 using the most current Missouri Farm Facts. Have students complete AS 5.1. Discuss local county rankings as appropriate.

Q3. **How may Missouri agriculture change in the future?**

A3. a) **Fewer farmers, larger farms**
b) **More hobby farms, but less family farms**
c) **Increase in total cash receipts**
d) **Development of new crops**
e) **Exports of agricultural products to other countries will increase**
f) **Greater attention to impact of agriculture on the environment**

The future of agriculture is very significant for many reasons. As the state's largest industry, the future of agriculture is important to the future of Missouri. Agriculture in the state is expected to change in several ways.

F. Other activities

1. Ask a representative from the Missouri Department of Agriculture or the Cooperative Extension Service to talk to the class.

2. Take the class on a tour of a diversified farming operation.

G. Conclusion

Agriculture in Missouri is very important to everyone in the state. Missouri has a wealth of assets that contribute to the agricultural industry. More people are employed in the industry of agriculture in Missouri than any other field. Missouri ranks among the top states in the production of several agricultural commodities. Changes are expected in Missouri agriculture over the next few years. However, the importance of the industry to the economy of the state will remain.

H. Competency

Describe agriculture in Missouri.

Related Missouri Core Competencies and Key Skills: none

I. Answers to Unit Evaluation

1.	F	(Lesson 1)
2.	T	(Lesson 1)
3.	F	(Lesson 2)
4.	T	(Lesson 4)
5 .	T	(Lesson 5)
6.	d	(Lesson 1)
7.	b	(Lesson 1)
8.	d	(Lesson 2)

9. c (Lesson 3)
10. d (Lesson 3)
11. a (Lesson 4)
12. c (Lesson 4)
13. a (Lesson 5)
14. b (Lesson 5)

15. Today, agriculture is producing, processing, marketing, and distributing food and fiber products. (Lesson 1)

16. Three of the following: steel plow, mechanical harvester, gasoline-powered tractor, commercial fertilizers, cotton gin, mechanical cotton picker, new crops, crop rotation (Lesson 2)

17. Two of the following: more efficient machinery, alternative uses of agricultural products, more use of computers and electronic monitors, increased world trade, use of pest-resistant plants, less use of pesticides, more efficient animals (Lesson 3)

J. Answers to AS 5.1 - Agricultural Commodities produced in Missouri

Answers should be checked to the most current Missouri Farm Facts. The answers given below are from the 1990 edition.

COMMODITY	AREA OF PRODUCTION
Corn	Northern Half and Bootheel
Cotton	Bootheel
Wheat	Northeast and Bootheel
Soybeans	North Central and Bootheel
Hay	Southwest
Dairy	Southwest
Hogs and Pigs	North Central
Beef Cows	Southwest
Sheep and Lambs	Northern Third
Grain Sorghum	Bootheel and Central
Rice	Bootheel
Tobacco	Missouri River Bottom

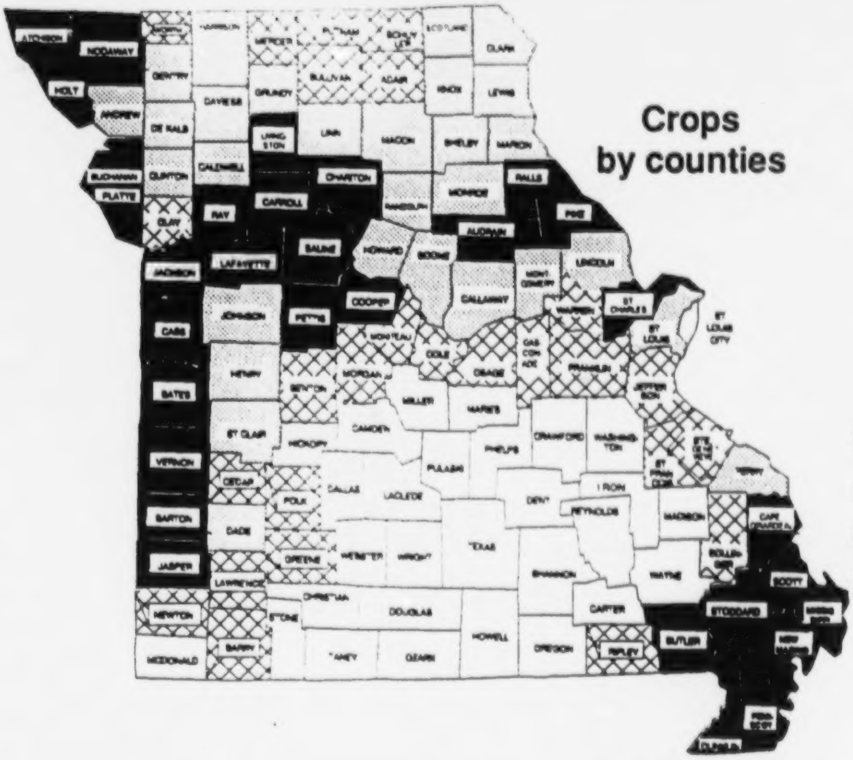
TM 1.2

1989 Missouri's General Ranking

Second in Beef Cattle and Calves
Second in Hay
Fourth in Winter Wheat
Fourth in Grain Sorghum (Milo)
Fifth in Turkeys
Sixth in Hogs and Pigs
Sixth in Soybeans
Sixth in Rice
Sixth in Concord Grapes
Seventh in American Cheese
Ninth in Corn
Ninth in Butter
Tenth in Cotton
Eleventh in Milk
Thirteenth in Eggs
Thirteenth in Red Meat
Fourteenth in Chickens

HO 5.1

1988 Cash Receipts



Crops by counties

TOP TEN COUNTIES

Stoddard	$95,171,000
New Madrid	$88,186,000
Mississippi	$66,671,000
Pemiscot	$62,075,000
Dunklin	$57,649,000
Saline	$50,643,000
Audrain	$49,871,000
Butler	$47,594,000
Lafayette	$47,028,000
Chariton	$45,426,000

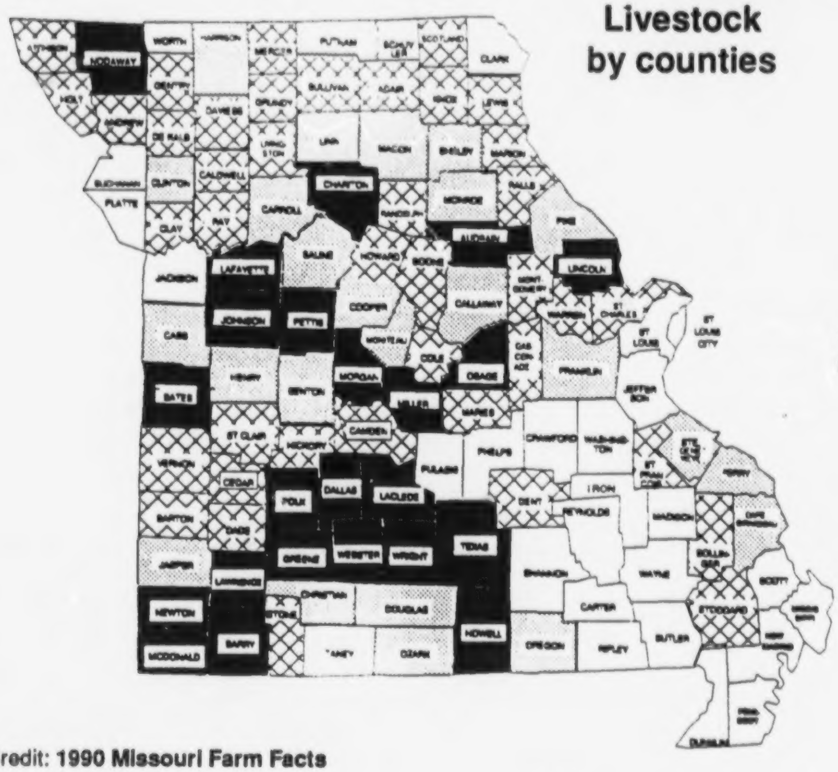
These top ten counties represent 33.6% of the State's total cash receipts for crops.

$20,000,000 and Above ■

$10,000,000-$19,999,999 ▨

$2,500,000-$9,999,999 ☒

Under $2,500,000 ☐



Livestock by counties

TOP TEN COUNTIES

McDonald	$68,540,000
Newton	$55,623,000
Lawrence	$54,469,000
Barry	$48,425,000
Wright	$47,628,000
Osage	$44,497,000
Nodaway	$43,350,000
Polk	$42,905,000
Webster	$41,452,000
Howell	$41,397,000

These top ten counties represent 21.3% of the State's total cash receipts for livestock.

$30,000,000 and Above ■

$20,000,000-$29,999,999 ▨

$10,000,000-$19,999,999 ☒

Under $10,000,000 ☐

Credit: 1990 Missouri Farm Facts

Lesson 5: Agriculture in Missouri

Name ____________________

AGRICULTURE COMMODITIES PRODUCED IN MISSOURI

Objective: The student will be able to identify where major commodities are produced in Missouri.

Twelve agricultural commodities produced in Missouri are listed below. Using Missouri Farm Facts, identify areas of the state that have high concentrations of the commodity. One commodity has been done for you.

COMMODITY	AREA OF PRODUCTION
Corn	Northern Half and Bootheel
Cotton	
Wheat	
Soybeans	
Hay	
Dairy	
Hogs and Pigs	
Beef Cows	
Sheep and Lambs	
Grain Sorghum	
Rice	
Tobacco	

Name ____________________

Date ____________________

UNIT EVALUATION

True or False (Place the correct response in the blank.)

_____ 1. Agriculture employs 50 million people in the U.S.

_____ 2. The average U.S. worker spends 16 percent of his or her disposable income on food.

_____ 3. Advancements in agriculture have provided fewer jobs in agriculture.

_____ 4. U.S. agriculture helps other countries by providing disaster relief.

_____ 5. In 1989, there were 108,000 farms in Missouri.

Circle the letter that corresponds to the best answer.

6. How much do U.S. consumers spend on food each year?

   a. $44 million
   b. $444 million
   c. $44 billion
   d. $444 billion

7. Which of the following factors cause agriculture to vary across the country?

   a. Age of farmers
   b. Soil conditions
   c. Hours in a day
   d. Size of the state

8. Which government program provides coupons for people to buy food at a reduced cost?

   a. School Lunch Program
   b. Surplus Commodity Distribution Program
   c. WIC Program
   d. Food Stamp Program

9. What might be some benefits of disease-resistant farm animals?

   a. Increase in the animal's feed costs
   b. Decrease in the farmer's profit
   c. Decrease in the farmer's production costs
   d. Increase in the processor's costs

10. What is the goal of U.S. agricultural research?

a. Maintain a monopoly of the food production for the world
b. Prevent other countries from producing all their own food
c. Increase U.S. food imports
d. Increase the availability of food to the world

11. How do agricultural advancements affect U.S. citizens?

a. Improved food quality
b. Increased taxes
c. Inflated food costs
d. Raised prices of food

12. What was the value of agricultural products produced in Missouri in 1989?

a. $4 million
b. $400 million
c. $4 billion
d. $400 billion

13. Which of the following commodities did Missouri have the highest national ranking in 1989?

a. Beef cattle
b. Pork
c. Turkeys
d. Milk

14. How much have Missouri's cash receipts from agriculture risen in the last few years?

a. 1-2 percent
b. 2-3 percent
c. 5-6 percent
d. 7 percent

Complete the following short answer questions.

15. What is agriculture today?

16. What are four inventions that changed agricultural production?

a.
b.
c.
d.

17. How will agriculture change in the future? Name two ways.

a.
b.

UNIT II - ANIMALS IN SOCIETY

Lesson 1: Importance of Animals

Objective: The student will be able to describe the importance of animals.

Study Questions

1. **What services and products are provided by animals?**
2. **Why are animals cared for differently?**
3. **How should people care for their animals?**

Reference

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit II.

UNIT II - ANIMALS IN SOCIETY

Lesson 1: Importance of Animals

TEACHING PROCEDURES

A. Introduction

Humans have used animals for thousands of years. Although the date of domestication is not known, animals have provided many services and products.

B. Motivation

Today in many parts of the world and in the U.S., animals remain a vital part of everyday life. Ask students to list the different animals they saw on their way to school. Divide the lists into wild animals and domestic animals. Have students discuss the type of care each animal receives from people. Recognize that most wild animals do not receive care directly from people.

C. Assignment

D. Supervised study

E. Discussion

Q1. What services and products are provided by animals?

A1.
a) Food
b) Leather and fiber products
c) Transportation
d) Beasts of burden (animal power)
e) Medical research
f) Medicine
g) Seeing eye dogs
h) Companionship

For centuries, animals have provided many important services and products to people. Early in history (and even today) animals have been used in farming. Oxen, mules, and horses were used to pull tillage implements. Most animal-powered farming is done in developing countries although some areas of the U.S. still use horses. Discuss the services and products provided by animals.

Q2. Why are animals cared for differently?

A2. **Treatment depends upon the service or purpose the animal is providing.**

There are many requirements and responsibilities to owning animals. Pets generally receive higher levels of care than meat animals. House pets would receive higher levels of care then outdoor pets. Each species of animal has unique food and shelter needs. However, all animals should be treated in a humane manner. Discuss why animals are treated differently.

Q3. How should people care for their animals?

A3.
- **a) Provide adequate food, water, and shelter.**
- **b) Provide preventative medical care and treatment.**
- **c) Keep accurate animal health records.**
- **d) Avoid overcrowding.**
- **e) Avoid lengthy trips without adequate rest stops.**
- **f) Check animals daily.**
- **g) Don't use sticks, canes, and clubs on animals.**
- **h) Provide proper training.**

Since animals cannot talk and communicate their needs, owners must take care of them. Compare and contrast the levels of care for indoor pets, outdoor pets, and farm animals. Discuss the factors that must be considered in managing animals. Ask students with pets at home to describe what they do to care for their pet.

F. Other activities

1. Invite a zoo keeper, conservation agent, or a veterinarian to your class to talk about animal care and owner responsibilities.

2. Have students select an animal from a teacher-created list and do a report on how to properly care for the animal.

3. Invite a representative from the Pork Producers or Beef Producers commodity organizations to describe how farmers care for their animals.

G. Conclusion

Animals have served an important part in the world's development and advancement. Animals provide many goods and services for people. Animals provide food, leather, fiber, medicines, labor and the pleasure of companionship.

H. Competency

Describe the importance of animals.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

UNIT II - ANIMALS IN SOCIETY

Lesson 2: Animal Ownership

Objective: The student will be able to discuss animal welfare and control regulations.

Study Questions

1. **What is meant by the term "animal welfare"?**
2. **What are the purposes of animal control regulations?**
3. **Why are there animal welfare laws?**
4. **What are the responsibilities of animal ownership?**

Reference

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit II.

TEACHING PROCEDURES

A. Review

Review why animals are treated differently and the factors that should be considered in managing animals. This lesson will discuss the need for animal control regulations. Regulations for animal control are necessary to protect both animals and people.

B. Motivation (Select one.)

1. Show the video Animal Agriculture Myths and Facts available from the Missouri Vocational Resource Center.

2. Present to the class the following situation:

Situation - One pair of cats (male and female) and one pair of dogs (male and female) are allowed to breed. Each female cat averages three litters per year with four kittens in each litter. Each female dog averages one litter per year with four puppies. Assume that half of the offspring are female and that all animals live. How many cats and dogs would there be at the end of one year, two years, three years, and four years?

Answer - Formula: Total # of animals x 50% x # of offspring per female = number of offspring

Year 1:
cats: 2 x .50 x 12 = 12 dogs: 2 x .50 x 4 = 4

Year 2:
cats: 14 x .50 x 12 = 84 dogs: 6 x .50 x 4 = 12

Year 3:
cats: 98 x .50 x 12 = 588 dogs: 18 x .50 x 4 = 36

Year 4:
cats: 686 x .50 x 12 = 4,116 dogs: 54 x .50 x 4 = 108

Open the discussion as to the possible problems from this uncontrolled breeding and what could be done about it. Write on the chalkboard the suggestions or possible questions during this discussion.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is meant by the term "animal welfare"?

A1. Providing care for the well-being of an animal.

Discuss problems associated with owning animals and not properly caring for them. Additional veterinary bills, and other added expenses could be incurred. Animal owners and managers must recognize the importance of proper animal care. Improper treatment may be detrimental to the animal's welfare. Inhumane treatment of animals should not be tolerated.

Q2. What are the purposes of animal control regulations?

A2. a) **To protect people from animals**
b) **To prevent the spread of animal diseases**

Animal control regulations address health/vaccination requirements, shelter and space requirements, and prevents keeping wild animals for pets. Animals left uncontrolled can be harmful to themselves and to people. Discuss problems caused by animal over-population. Sick animals pose a threat to the entire animal population. Human health can also be affected by sickness in an animal population.

Q3. What are there animal welfare laws?

A3. **To ensure humane care of animals**

Not everyone that owns a car knows how to care for it. Sometimes even knowing how to do something is not enough, car maintenance must be done in order to keep a car running properly. Animal care is like this also. Most people know how to care for animals they just don't do what they know they should. Animal welfare laws govern the treatment of animals and require a reasonable standard of humane treatment of all animals.

Q4. What are the responsibilities of animal ownership?

A4. **Animal owners should provide proper:**
a) **Food**
b) **Shelter**
c) **Health care**
d) **Exercise**

Owners must provide the proper quantity and quality of food to meet the needs of their animals. Fresh food and water are daily requirements. Although veterinarians are animal health professionals, animal owners are also responsible for providing a reasonable standard of health care. Many animals need frequent exercise to maintain good health. Owners need to provide the time and space for animals to get proper amounts of exercise.

NOTE: Have students participate in a debate, animal welfare versus animal rights. Divide the class into two groups. Assign each group a position at the beginning of the unit. Allow time to research issue. With teacher as moderator, allow students to debate. (5 minutes for each position, 5 minutes for each rebuttal, and 5 minutes to refute each rebuttal) Teacher should summarize and lead the group to an appropriate conclusion.

F. Other activities

1. Have a representative from a pet store, the conservation department or the humane society speak on problems associated with animal overpopulation. The representative could also speak about animal control regulations and animal welfare versus animal rights.

2. Have a veterinarian speak to the class about animal (large or small) care.

G. Conclusion

Animals do not have the ability to reason as do people. Animal control regulations are for the protection of both animals and people.

H. Competency

Discuss animal welfare and control regulations.

Related Missouri Core Competencies and Key Skills:

7C-2: Distinguish fact from opinion and justify response.
7K-2: Analyze oral presentations of others for speaker's point of view, speaker's message, nonverbal cues that interfere with or support message, inferences made, fact, opinion disguised as fact, and speaker's purpose.
7K-4: Determine and summarize differences of opinion in discussions and debates.
7K-2: Identify arguments on both sides of specific local issues.
7L-1: Recognize instances of persuasive techniques being used in communication and the techniques used; identify the points of view of individuals who are communicating on topics of political controversy; evaluate the evidence they use to support their points of view.
8C-2: Distinguish fact from opinion and justify response.
8K-2: Analyze oral presentations of others for speaker's point of view, speaker's message, nonverbal cues that interfere with or support message, inferences made, fact, opinion disguised as fact, and speaker's purpose.
8K-4: Determine and summarize differences of opinion in discussions and debates.
8K-2: Identify arguments on both sides of specific local issues.
8L-1: Recognize instances of persuasive techniques being used in communication and the techniques used; identify the points of view of individuals who are communicating on topics of political controversy; evaluate the evidence they use to support their points of view.
8Q-5: Identify and explain, with examples, why in the U.S. economy governments of various levels engage in some regulation of businesses; identify costs and benefits for individuals and businesses of various government regulations dealing with such matters as competition, health, safety, and fairness.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

UNIT II - ANIMALS IN SOCIETY

Lesson 3: Regulations Governing Animal Care and Control

Objective: The student will be able to describe laws governing the care and control of animals.

Study Questions

1. **What types of laws affect animals?**
2. **What local regulations govern the care and control of animals?**
3. **What state regulations govern the care and control of animals?**

Reference

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit II.

UNIT II - ANIMALS IN SOCIETY

Lesson 3: Regulations Governing Animal Control

TEACHING PROCEDURES

A. Review

Review what animal welfare is and why there are animal welfare laws. Animals serve many functions in society. This lesson will discuss the regulations governing animal care and control. Laws on the local and state levels have been established to provide guidelines in relation to animals.

B. Motivation

Find out if there is a city or county ordinance in your area that requires all cats and dogs to be vaccinated for rabies. Check on other local animal control ordinances. Ask the class why ordinances are desirable.

C. Assignment

D. Supervised study

E. Discussion

Q1. What types of laws affect animals?

A1. a) Animal identification
b) Care and treatment
c) Registration
d) Transportation and handling
e) Laboratory use
f) Disease prevention

Laws provide guidelines from which a person can govern his or her actions.

Q2. What local regulations govern the care and control of animals?

A2. a) Leash laws
b) Vaccination programs
c) Noise ordinances
d) Animal abuse ordinances

Each city has ordinances that are established to control animals. Leash laws have been implemented to keep dogs from running through neighborhoods. Dogs running wild tend to fight and whelp (give birth) frequently. Neither is desirable. Vaccination requirements reduce infectious diseases among animals. Noise ordinances have been established to limit the disruptions caused by barking dogs in residential areas. Animal abuse ordinances insure that animals in the jurisdiction are treated properly. Discuss these ordinances.

Q3. What state regulations govern the care and control of animals?

A3. **a) Transportation of animals across state lines**
b) Conservation laws
c) Disease control

State officials are concerned for the people and animals that live in the state. Interstate transportation controls are designed to prevent the spread of infectious diseases across state boundaries. Conservation laws are intended to regulate wildlife populations by controlling the amount, size, and/or gender of game that can be taken. Some animals must be blood tested for disease control before they can be sold as breeding stock.

F. Other activities

1. Invite a representative from the Department of Conservation to talk about wildlife control, governing laws, and conservation versus preservation.
2. Invite a city government official to talk about citizen responsibility and local laws or ordinances concerning animals.

G. Conclusion

Regulations affecting animals benefit both animals and people. Local regulations generally relate to the control of animals. State regulations are usually directed toward the care and treatment of animals.

H. Competency

Describe laws governing the care and control of animals.

Related Missouri Core Competencies and Key Skills:

7K-2: Analyze oral presentations of others for speaker's point of view, speaker's message, nonverbal cues that interfere with or support message, inferences made, fact, opinion disguised as fact, and speaker's purpose.
7K-2: Identify arguments on both sides of specific local issues.
7L-1: Recognize instances of persuasive techniques being used in communication and the techniques used; identify the points of view of individuals who are communicating on topics of political controversy; evaluate the evidence they use to support their points of view.
8K-2: Analyze oral presentations of others for speaker's point of view, speaker's message, nonverbal cues that interfere with or support message, inferences made, fact, opinion disguised as fact, and speaker's purpose.
8K-2: Identify arguments on both sides of specific local issues.
8L-1: Recognize instances of persuasive techniques being used in communication and the techniques used; identify the points of view of individuals who are communicating on topics of political controversy; evaluate the evidence they use to support their points of view.

I. Answers to Unit Evaluation

1. T (Lesson 1)
2. T (Lesson 1)
3. F (Lesson 1)
4. b (Lesson 2)
5. d (Lesson 2)

6. c (Lesson 2)
7. d (Lesson 3)
8. b (Lesson 3)
9. Four of the following: food, leather and fiber products, transportation, beasts of burden (animal power), medical research, medicine, cosmetic testing, seeing eye dogs, companionship (Lesson 1)

10. (Lesson 2)
    a) Food
    b) Shelter
    c) Health care
    d) Exercise

11. The instructor will need to determine if answers are appropriate. (Lesson 3)

Name ________________

Date ________________

UNIT EVALUATION

True or False (Place the correct response in the blank.)

____ 1. Early in history, animals provided food, clothing, and transportation.

____ 2. Medicines beneficial to humans have been discovered by using animals in research.

____ 3. Animals do not possess the ability to provide companionship to people.

Circle the letter that corresponds to the best answer.

4. Animals need ______________.

   a. Food, clothing, and shelter
   b. Food, water, and shelter
   c. Food, social interaction, and shelter
   d. Food, water, and clothing

5. Daily attention to animals ______________.

   a. Is necessary for the owners peace of mind
   b. Is necessary because laws say it should be done
   c. Is necessary because local ordinances say it should be done
   d. Is necessary for a healthy animal

6. Animal welfare laws are established to ______________.

   a. Prohibit owners from purchasing the wrong type of animals
   b. Promote publicity of cruelty to animals
   c. Ensure humane care of animals
   d. Protect animals from animals

7. Which of the following is a local regulation that ensures protection of people from animals?

   a. Animal size regulations
   b. Animal age regulations
   c. Speed limits in residential areas
   d. Vaccination programs

8. State laws that regulate transportation of animals across state lines are enforced to ______.

   a. Prevent theft
   b. Prevent the spread of diseases
   c. Prevent population control
   d. Prevent injury to animals

Complete the following short answer questions.

9. What are four services or products provided by animals?

   a.
   b.
   c.
   d.

10. What are the four main responsibilities of an animal owner?

    a.

    b.

    c.

    d.

11. What are two animal control regulations in your community?

UNIT III - PLANTS IN OUR ENVIRONMENT

Lesson 1: How Horticulture Affects Our Lives

Objective: The student will be able to describe how horticulture affects our lives.

Study Questions

1. **Why are plants important?**
2. **What is horticulture?**
3. **What areas of science are related to horticulture?**
4. **What career areas are available in horticulture?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit III.
2. Activity Sheets
    - a) AS 1.1: Planting Seeds
    - b) AS 1.2: Horticultural Businesses

Lesson 1: How Horticulture Affects Our Lives

TEACHING PROCEDURES

A. Introduction

Plants are an important part of life. They help make the environment more enjoyable, and without plants, humans would not be able to breathe or eat. This unit on horticulture is designed to give a basic understanding of the importance of plants and an understanding of horticulture. It also provides information about plant growth and plant care. This unit will also provide a starting point for planning a fruit and vegetable garden.

B. Motivation (Select one.)

1. Bring in a wide variety of materials from horticulture and the related sciences. Mushrooms, ferns, garden flowers, lumber samples, fruits, vegetables, grain crops, cattails, cut flowers, and peanut butter are some examples. Have the students discuss how the items are similar and how they are different. Discuss how each item is or is not important to humans.

2. Have students identify and make a list of the plants that grow in their yards and gardens. They may use relatives' or neighbors' homes. Relatives and friends are encouraged to help them identify the plants. Discuss their plant lists and what benefits the plants provide.

C. Assignment

Have students plant seeds (AS 1.1) the first day of class. Ask students what is going to happen with the seeds they have planted. The students should check on their seeds each day to watch for growth.

D. Supervised study

E. Discussion

Q1. Why are plants important?

A1.
- **a) Biological benefits**
  - **1) Convert carbon dioxide to oxygen**
  - **2) Provide food**
- **b) Physical benefits**
  - **1) Provide materials for shelter**
  - **2) Provide materials for clothing**
  - **3) Provide shade, cooling, and wind control**
  - **4) Reduce wind and water erosion**
  - **5) Provide energy sources**
  - **6) Provide habitat for wildlife**
- **c) Emotional benefits**
  - **1) Provide beauty from landscapes and individual specimens**
  - **2) An enjoyable hobby**
  - **3) Provide a relaxing effect**

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Bring in several items that make plants important to people. Examples might include peanut butter, cotton clothing, a board, firewood, vegetables, fruits, and a blooming flower. Ask students why each item is important.

Q2. What is horticulture?

A2. **Horticulture includes the production and marketing of fruits, vegetables, and ornamental plants.**

Bring in several examples of fruits, vegetables, and ornamental plants. Discuss why these plants are all part of horticulture.

Q3. What areas of science are related to horticulture?

A3.
- a) **Botany is the study of plants in their natural environment.**
- b) **Agronomy, or field crops, is the large scale production of plants for grain, forage, or fiber.**
- c) **Forestry is the growing of trees for lumber, paper, and the natural beauty of forests.**

Bring in samples of plants that fall into these areas and discuss why they do not belong in the area of horticulture. Some examples might include algae or plankton for botany; field corn, cotton, or hay for agronomy; and a walnut or redwood board to represent forestry.

Q4. What career areas are available in horticulture?

A4.
- a) **Fruit production, processing, and marketing**
- b) **Vegetable production, processing, and marketing**
- c) **Floral design**
- d) **Greenhouse production**
- e) **Nurseries and tree farms**
- f) **Interior landscaping**
- g) **Landscaping**
- h) **Golf course maintenance**
- i) **Lawn care**

Bring in several phone books and have students look for horticultural businesses in the area or in a nearby urban area. Pass out AS 1.2. This may work better in small groups of three or four students. Have the students fill in businesses that fit in the categories. After five to ten minutes, have students report to the class what horticultural businesses they have found.

F. Other activities

1. Have people from horticultural industries talk to the class.

2. Make a bulletin board with examples of how people benefit from plants or with pictures of different horticultural careers.

3. Take a field trip to a floral shop, greenhouse, nursery, or orchard.

4. Have students make a bud vase or small flower arrangement.

G. Conclusion

Plants are essential for humans to breathe and eat. Plants make life more comfortable because they provide shelter, clothing, and shade. Plants also make our world more pleasant through their beauty. Horticulture is the intensive production of plants for food and beauty, including flowers, trees, and turfgrass. Horticulture is related to the fields of botany, agronomy, and forestry.

H. Competency

Describe how horticulture affects our lives.

Related Missouri Core Competencies and Key Skills: None

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

The instructor will need to determine if answers are appropriate.

Lesson 1: How Horticulture Affects Our Lives

Name ________________

PLANTING SEEDS

Objective: The student will be able to plant seeds.

Materials:

1 container - flower pot, cup, etc.
Potting soil
Seeds - to be provided by instructor
Water

Procedure:

1. Watch the instructor demonstrate how to plant seeds.
2. If you are using a cup instead of a flower pot, place a hole in the bottom so the water can drain out.
3. Fill the pot with soil up to one-half inch from the top.
4. Use your finger to made a small hole in the soil.
5. Place the seed in the hole and cover lightly with the soil.
6. Water thoroughly.
7. Place the pot in a well-lighted area, such as by a window.
8. Watch the plant grow. Provide care when needed.

Lesson 1: How Horticulture Affects Our Lives

Name ________________

HORTICULTURAL BUSINESSES

Objective: The student will be able to identify horticultural businesses in the community.

Using a phone book, identify the following types of horticultural businesses.

a. Nursery
   1.
   2.

b. Florist
   1.
   2.

c. Landscape Designer or Landscape Architect
   1.
   2.

d. Greenhouse
   1.
   2.

e. Golf Course Maintenance
   1.
   2.

f. Lawn Maintenance
   1.
   2.

g. Tree Specialist or Arborist
   1.
   2.

h. Seed Store
   1.
   2.

UNIT III - PLANTS IN OUR ENVIRONMENT

Lesson 2: Plant Growth and Reproduction

Objective: The student will be able to describe the basic plant growth factors and the parts of a plant.

Study Questions

1. **What are the functions of the four major parts of a plant?**
2. **What are photosynthesis, respiration, and transpiration?**
3. **What are the seven factors important in plant growth?**
4. **What two ways are plants reproduced?**
5. **What are the four main parts of a flower?**
6. **What are the seven common asexual propagation methods?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit III.
2. Transparency Masters
    a) TM 2.1: Main Parts of a Plant
    b) TM 2.2: Parts of a Complete Flower
3. Activity Sheets
    a) AS 2.1: Effect of Light on Photosynthesis
    b) AS 2.2: Parts and Functions of a Complete Flower
    c) AS 2.3: Starting Plants from Stem Cuttings (Asexual Propagation)

TEACHING PROCEDURES

A. Review

Plants provide people with oxygen to breathe, food to eat, shelter, etc. Horticultural plants are grown intensively for food or for beauty. Many horticultural careers are available in areas such as landscaping, fruit production, lawn care, floral design, and vegetable production.

B. Motivation (Select one.)

1. Bring in examples of plants showing different stress problems such as excessive light, too little light, excessive water, compacted soil, lack of fertilizer, or pollution damage. Discuss the plant problems and what caused them. Discuss how proper conditions would allow for better growth.

2. Ask students, Why are flowers the color that they are? Which part of the flower is male and which part is female?

3. Demonstrate several methods of plant propagation. Examples may include air layering a rubber plant, grafting a fruit tree, planting a bulb or tuber, or dividing a perennial flower.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are the functions of the four major parts of a plant?

A1.
- **a) Leaf**
    - **1) Major producer of food for the plant (through photosynthesis)**
    - **2) Food storage area**
    - **3) Site of respiration and transpiration**
- **b) Root**
    - **1) Absorbs water and minerals from the soil**
    - **2) Anchors the plant**
    - **3) Food storage area**
- **c) Stem**
    - **1) Supports the plant's, leaves, and flowers**
    - **2) Transports water and minerals up to the leaves**
    - **3) Transports manufactured food from the leaves to all parts of the plants**
    - **4) Site of some photosynthesis**
    - **5) Food storage area**
- **d) Flower**
    - **1) Site of sexual propagation**
    - **2) Source of fruit and seed**
    - **3) Attracts pollinators**

Bring into class a flowering plant and have the class discuss the four main parts. Ask students to tell the function of the four main parts. Use TM 2.1 to show the four main parts.

Q2. What are photosynthesis, respiration, and transpiration?

A2. a) **Photosynthesis is the process that occurs in green parts of plants. Chlorophyll reacts with water, carbon dioxide, and sunlight to produce oxygen and simple sugars.**
b) **Respiration is the process of converting the simple sugars and oxygen to produce energy for the plant. It is the reverse of photosynthesis.**
c) **Transpiration, similar to perspiration, is the cooling process that releases water from the plant.**

Bring in examples of plants with different leaf sizes and colors and have the students discuss how they may differ in their ability to photosynthesize. Have students complete AS 2.1.

Q3. What are the seven factors important in plant growth?

A3.
- **a) Moisture**
  - **1) Essential for photosynthesis**
  - **2) Maintains cell shape**
  - **3) Enables nutrients to be absorbed and transported throughout the plant**
  - **4) Needed for transpiration and respiration**
  - **5) Transports manufactured food to all parts of the plant**
- **b) Humidity**
  - **1) Humidity helps prevent leaves from drying.**
  - **2) Higher humidity slows transpiration.**
- **c) Temperature**
  - **1) Plants differ greatly in their tolerance for hot and cold temperatures.**
  - **2) Extremes in temperature can cause slow growth, fruit or flower damage, or death of the plant.**
- **d) Light**
  - **1) Plants need different levels of light intensity.**
  - **2) Light is required for photosynthesis.**
- **e) Gases**
  - **1) Carbon dioxide is needed for photosynthesis.**
  - **2) Oxygen is needed by the roots and the leaves in the respiration process.**
- **f) Soil**
  - **1) Provide support for the roots**
  - **2) Allow water and air filtration and movement**
  - **3) Store needed nutrients**
- **g) Nutrients**
  - **1) Sixteen nutrients are essential for plant growth.**
  - **2) Three nutrients are commonly applied as fertilizers.**
    - **(a) Nitrogen**
    - **(b) Phosphorus**
    - **(c) Potassium**

Ask students what things are essential to human growth. Then ask what things are essential for plant growth. Compare the similarities?

Q4. What two ways are plants reproduced?

A4.
- a) Sexually
  - 1) Sexual propagation occurs within the flower as a result of pollination.
  - 2) This produces a fruit and seeds.
- b) Asexually
  - 1) Asexual propagation uses vegetative parts.
  - 2) Asexual techniques can produce new plants from leaves, stems, and roots, depending on the plant.

Bring in some garden flower seeds to show the product of sexual propagation and how easily they may be handled. Also bring in a banana and a naval orange to illustrate the need for asexual propagation, due to their lack of viable seeds. Remind students about the seeds that they planted in Lesson 1. Point out that starting plants from seed is sexual propagation.

Q5. What are the four main parts of a flower?

A5.
- a) Petal - attracts insects for pollination
- b) Pistil
  - 1) Female structure of the flower
  - 2) Site of fruit and seed formation
  - 3) Contains the stigma, style, and ovary
- c) Sepal - protects flower in the early stages
- d) Stamen
  - 1) Male structure of the flower
  - 2) Produces pollen
  - 3) Contains the anther and filament

Bring in a large typical flower or a model of a flower to illustrate the different parts and explain their importance. Use TM 2.2, Parts of a Flower. Review the process of pollination after discussing the parts of a flower. Have students complete AS 2.2.

Q6. What are seven common asexual propagation methods?

A6.
- a) Cuttings
- b) Grafting
- c) Division
- d) Layering
- e) Budding
- f) Tissue culture
- g) Specialized plant structures
  - 1) Bulbs (onion, hyacinth)
  - 2) Corms (gladiolus)
  - 3) Rhizomes (Johnson grass, iris)
  - 4) Runners or stolons (strawberries)
  - 5) Tubers (potato)

Bring in samples of several plants or pictures of plants propagated by the various asexual propagation methods. Discuss how they were propagated. Pass out AS 2.2. Demonstrate how to take stem cuttings, then allow students to take some cuttings. Students should be allowed to take cuttings from several different plants.

F. Other activities

1. Do an in-depth study of one of the propagation techniques and demonstrate it to the class.
2. Have a nursery person come to demonstrate advanced propagation techniques, such as grafting, budding, or tissue culture.
3. Get a tissue culture kit from a science supply company (e.g., Carolina Biological Supply Co.). Do the tissue culture experiment with the help of the class.
4. Bring in potatoes and have the students cut them into pieces and plant them in pots. Have the students discuss why they will grow.
5. Show the videos Plant Propagation Vol. I and II available from the Missouri Vocational Resource Center.

G. Conclusion

Plants have four major parts that are all important for the plant's survival or reproduction. Plant growth is influenced by water, humidity, temperature, light, gases, soil, and nutrients. Plants can be reproduced sexually by using flowers to produce seeds or asexually by using vegetative plant parts.

H. Competency

Describe the basic plant growth factors and the parts of a plant.

Related Missouri Core Competencies and Key Skills: None

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

AS 2.1 - Effect of Light on Photosynthesis

The instructor will need to determine if answers are appropriate.

AS 2.2 - Parts and Functions of a Complete Flower

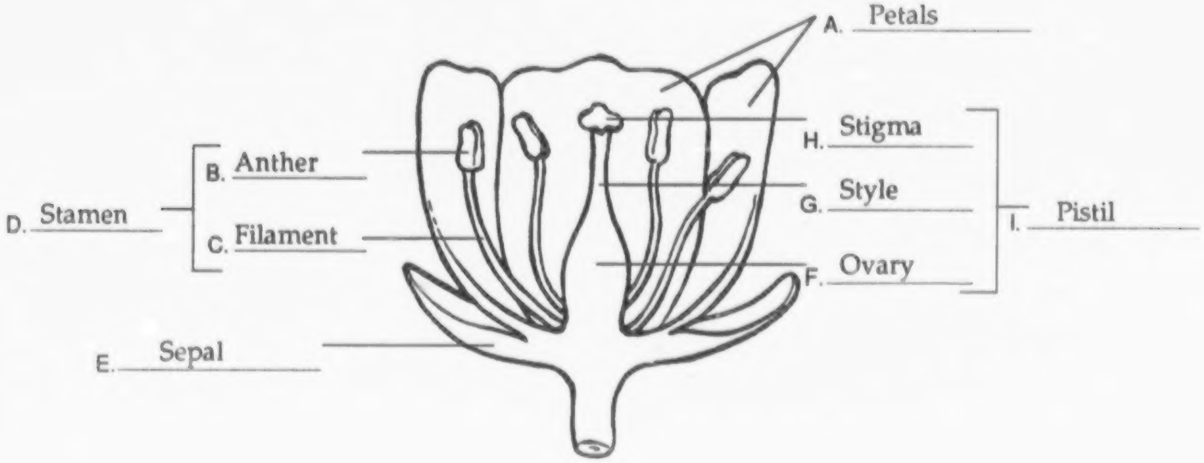
Answers are on the following page.

AS 2.3 - Starting Plants from Stem Cuttings

The instructor will need to determine if the student completes the activity in an appropriate manner.

AS 2.2 - Parts and Functions of a Complete Flower

Label the parts of a complete flower and give their functions below.


A. Petals
H. Stigma
B. Anther
G. Style
D. Stamen
I. Pistil
C. Filament
F. Ovary
E. Sepal

Functions:

A. Attracts insects for pollination

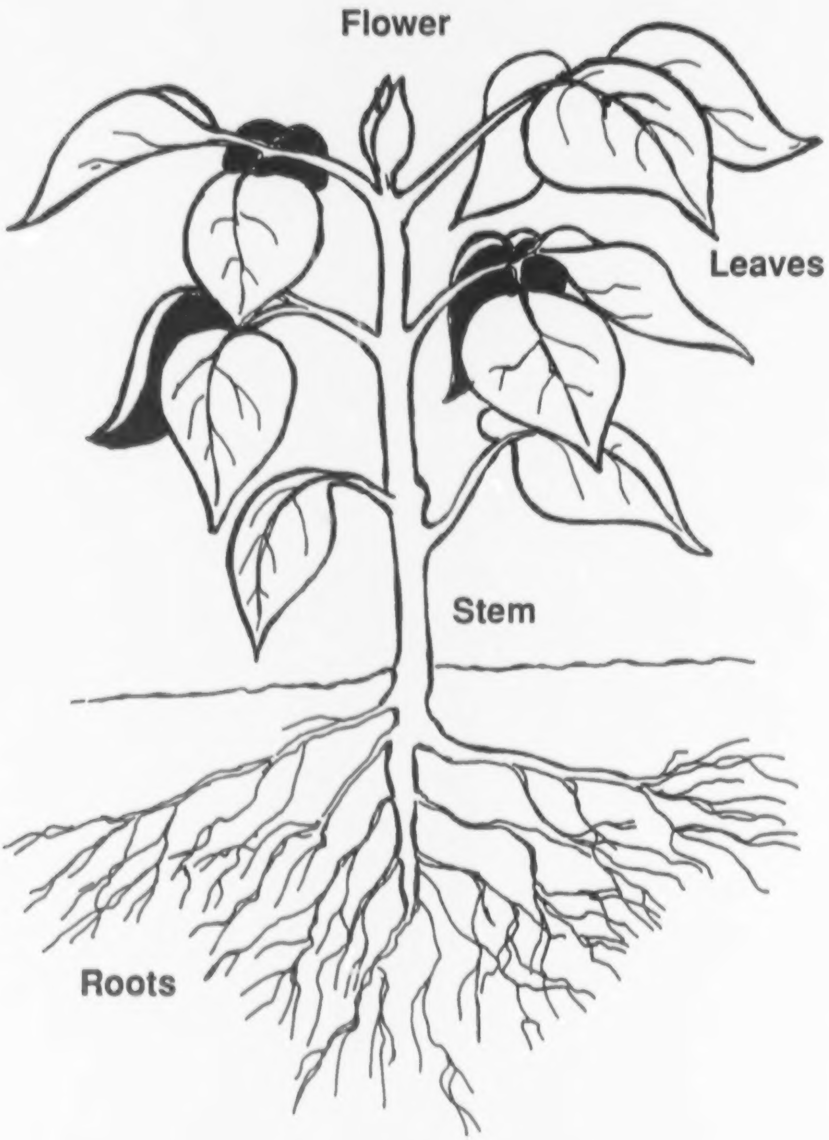
D. Male part of flower, produces pollen

E. Protects the flower in the bud stage

I. Female part of flower, site of fruit and seed formation

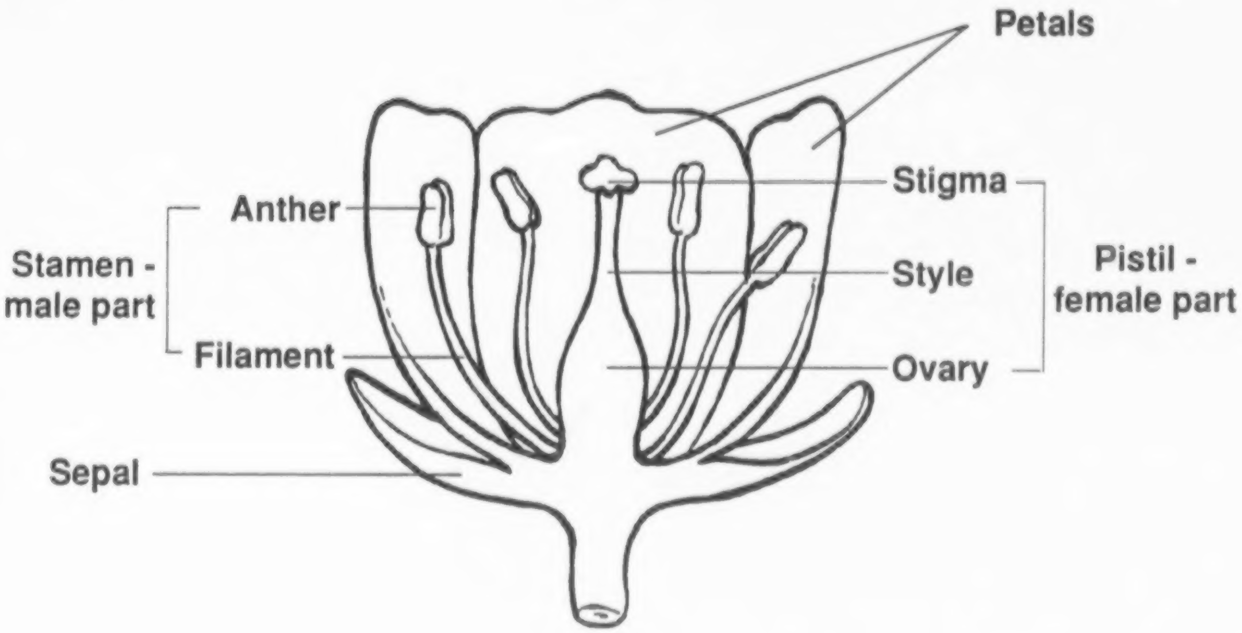
TM 2.1

Main Parts of a Plant


Flower
Leaves
Stem
Roots

TM 2.2

Parts of a Complete Flower


Petals
Anther
Stigma
Stamen - male part
Style
Pistil - female part
Filament
Ovary
Sepal

Lesson 2: Plant Growth and Reproduction

Name ________________

EFFECT OF LIGHT ON PHOTOSYNTHESIS

Objective: The student will be able to describe the effect of light on photosynthesis.

Materials:

2 - 2-liter empty soda bottles
Knife or scissors
Potting soil
2 plants of equal size (tomatoes, cabbage, etc.)
Water
Black plastic bag with tie

Procedures:

1. Rinse the soda bottles out and allow them to dry.
2. Using the knife or scissors cut the top one third of the bottle off.
3. Put two inches of soil in the bottom of each soda bottle (containers).
4. Carefully transplant the plants into the containers.
5. Moisten the soil and replace the tops of the soda bottles.
6. Place one container in a window to receive good light.
7. Place the other container in a thick black plastic trash bag. Tie it securely so that it will not receive light.
8. Allow plants to grow for two weeks.
9. Examine the plants.
    a. Did the plants grow the same amount?
    b. How did light or the lack of light affect photosynthesis?

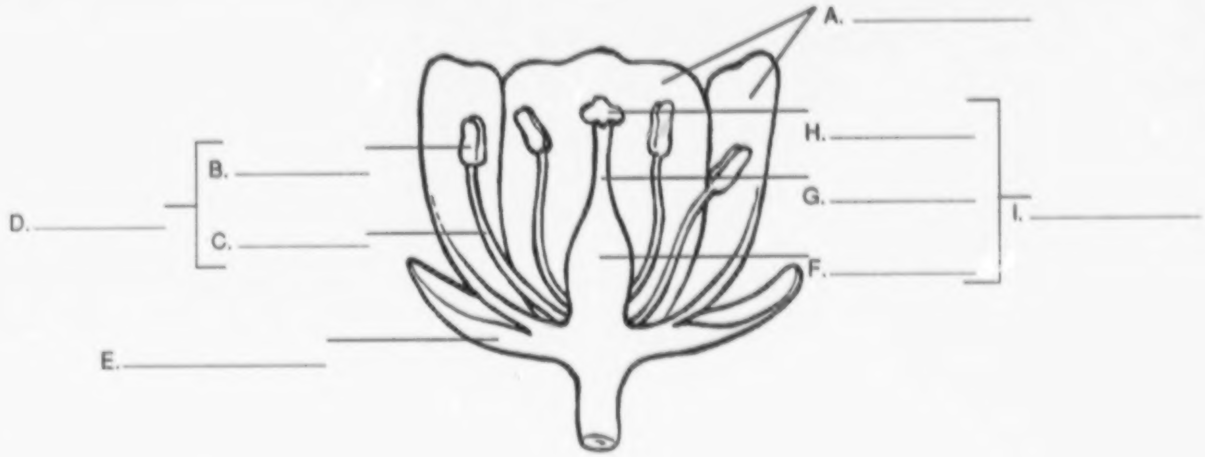
UNIT III - PLANTS IN OUR ENVIRONMENT AS 2.2

Lesson 2: Plant Growth and Reproduction Name ________________

PARTS AND FUNCTIONS OF A COMPLETE FLOWER

Objective: The student will be able to identify the parts of a complete flower and give their functions.

Label the parts of a complete flower and give their functions below.



Functions:

A. ____

D. ____

E. ____

I. ____

Lesson 2: Plant Growth and Reproduction

Name ________________

STARTING PLANTS FROM STEM CUTTINGS
(ASEXUAL PROPAGATION)

Objective: The student will be able to start a plant from a stem cutting.

Materials:

Potting soil
Pot - flower pot, cup, etc.
Plant for stem cutting - Check with your instructor.
Rooting hormone
Water
Small plastic bag with tie

Procedure:

1. Watch the instructor demonstrate how to start plants from stem cuttings.
2. If you are using a cup instead of a pot, place a hole in the bottom so the water can drain out.
3. Fill the pot with the soil up to one-half inch from the top.
4. Use your finger to make a hole one-inch deep in the soil.
5. Take the stem cutting from a plant determined by the instructor.
6. The cutting should have five to seven leaves.
7. Remove the bottom leaves from the stem.
8. Place rooting hormone on the bottom one-half inch of the stem.
9. Insert the cutting into the soil, and firm the soil around it.
10. Water thoroughly.
11. Place the pot in a sandwich bag and tie it closed to hold in the moisture.
12. Place the pot in a well-lighted area, such as by a window.
13. Watch the plant grow and provide care for it.

Lesson 3: Caring for Plants

Objective: The student will be able to identify the important factors to consider in caring for plants.

Study Questions

1. **What factors are important to consider in caring for plants?**
2. **What care should be provided for indoor plants?**
3. **What care should be provided for outdoor plants?**
4. **What pests cause problems with plants?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit III.
2. Activity Sheet
    a) AS 3.1: Plant Care Requirements

UNIT III - PLANTS IN OUR ENVIRONMENT

Lesson 3: Caring for Plants

TEACHING PROCEDURES

A. Review

Plants consist of four major parts that are essential to the growth and reproduction of the plant. The roots and stem are essential for absorbing and transferring nutrients. The leaves and stem are important sites for photosynthesis. The flower is the site of sexual reproduction. Many plants can also be reproduced by vegetative methods using stems, leaves or roots.

B. Motivation (Select one.)

1. Bring in samples of healthy plants and samples of plants showing water stress, soil problems, sun damage, or pest problems. Have students look at the top growth and root system. Discuss the differences between the healthy plants and those with problems. Discuss how proper care could help prevent these problems.

2. Ask students what humans need to survive? What do plants need to survive and grow?

C. Assignment

D. Supervised study

E. Discussion

Q1. **What factors are important to consider in caring for plants?**

A1. **a) Water**
b) Soil
c) Fertilizer
d) Light
e) Temperature
f) Humidity
g) Pest control

Bring in samples of plants with different water requirements, such as cactus, water lily, and philodendron. Discuss how a knowledge of their water requirements is important. Also bring in plants that have different light requirements, such as ferns, hostas, and geraniums. Discuss how trying to grow them under the same conditions will result in the death of some plants.

Q2. **What care should be provided for indoor plants?**

A2. **a) Provide regular watering.**
b) Control humidity levels.
c) Maintain appropriate temperature range.
d) Maintain appropriate light levels.
e) Provide suitable soil needs.
f) Fertilize regularly.

g) Prune dead or damaged leaves and branches.
h) Provide needed pruning to maintain the plant's shape.

Ask students, what care should be provided for indoor plants? Bring in several plants and discuss their care requirements.

Q3. What care should be provided for outdoor plants?

A3.
a) Watering is usually only required during dry periods.
b) Grow in areas where they are adapted.
c) Select tolerant plants where pollution can be a problem.
d) Fertilizer is generally only needed once per year.
e) Prune occasionally to remove dead and damaged leaves and branches.
f) Prune to maintain the plant's natural shape, when required.

Ask students to discuss the growing conditions that outdoor plants need. Which conditions are supplied by nature? Pass out AS 3.1.

Q4. What pests cause problems with plants?

A4.
a) Insects
b) Diseases
c) Weeds
d) Other problems
  1) Mammals
  2) Birds

Bring in samples of plants with evidence of insect, disease, or other pest damage. Discuss what type of problems they are and how the damage may have been prevented.

F. Other activities

1. Provide plants for students to care for at the school or at home for several weeks.

2. Have students design experiments to see how different levels of light, water, fertilizer, etc. affect plant growth.

G. Conclusion

Many factors must be considered when caring for plants. Plants differ on their need for these factors depending on the plant variety and on their location. When caring for plants, follow general guidelines. But it is very helpful to read about the plant to get specific recommendations.

H. Competency

Identify the important factors to consider in caring for plants.

Related Missouri Core Competencies and Key Skills: None

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 3.1 - Plant Care Requirements

The instructor will need to determine if answers are appropriate.

UNIT III - PLANTS IN OUR ENVIRONMENT AS 3.1

Lesson 3: Caring for Plants Name ________________

PLANT CARE REQUIREMENTS

Objective: The student will be able to identify care requirements of selected plants.

1. Select two houseplants and two outdoor plants to find their care requirements.
2. Use general references such as the one's listed below to find care information about the plants to fill in the chart. One example has been provided.
3. A few suggested references include:
    a) Introductory Horticulture. H. Edward Reiley and Carroll L. Shry, Jr. Delmar: Albany, NY, 1988.
    b) Reader's Digest Illustrated Guide to Gardening. Carroll C. Calkins, ed. 1978 Reader's Digest: Pleasantville, NY.
    c) University Extension Bulletins: University of Missouri-Columbia.

PLANT NAME	LIGHT NEEDS	WATER NEEDS	FERTILIZER NEEDS	SOIL TYPE	COMMON PESTS	OTHER INFORMATION
Boston Fern	partial sun	keep moist	feed lightly every 4 months	1-peat 2-sand 1-soil	mealy bugs	50-70°F temperature, mist often

UNIT III - PLANTS IN OUR ENVIRONMENT

Lesson 4: Fruit and Vegetable Gardening

Objective: The student will be able to explain the basic information needed to plan a garden or orchard.

Study Questions

1. **Why do people grow gardens and orchards?**
2. **What vegetables are commonly grown in Missouri?**
3. **What fruits are commonly grown in Missouri?**
4. **What are the basic steps in planning a garden?**
5. **What tools and equipment are needed to grow a home garden?**
6. **What is organic gardening?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit III.
2. Activity Sheets
   - a) AS 4.1: Planting a Row of Seeds for a Vegetable Garden
   - b) AS 4.2: Transplanting Plants in a Vegetable Garden

UNIT IV - PLANTS IN OUR ENVIRONMENT

Lesson 4: Fruit and Vegetable Gardening

TEACHING PROCEDURES

A. Review

Several factors should be taken into consideration when caring for plants. These factors include water, soil, fertilizer, light, humidity, temperature, and pest control. The needs of the plants will vary from one type of plant to the next. They also differ greatly from indoor and outdoor plants.

B. Motivation

Bring in samples of fresh fruits or vegetables and have the students discuss the advantages of growing their own fruits and vegetables. Have students identify them by taste or sight.

C. Assignment

D. Supervised study

E. Discussion

Q1. Why do people grow gardens and orchards?

A1.
- **a) To save money**
- **b) For fresher produce**
- **c) For convenience and availability**
- **d) For enjoyment, sense of pride, and relaxation**

Bring in samples of fresh and canned produce and have the students explain similarities and differences between them. Ask the students if any of them grow gardens or orchards and why they grow them.

Q2. What vegetables are commonly grown in Missouri?

A2.
- **a) Cole crops: broccoli, cabbage**
- **b) Greens: lettuce, Swiss chard**
- **c) Root crops: turnips, radishes, carrots**
- **d) Legumes: green beans, peas**
- **e) Vine crops: watermelons, squash, cucumbers**
- **f) Tomatoes**
- **g) Sweet corn**
- **h) Peppers**
- **i) Asparagus**

Bring in some common and unusual vegetables grown in Missouri and see if the students can identify them. Ask if any students have grown any of the vegetables.

Q3. What fruits are commonly grown in Missouri?

A3.
- a) **Apples and pears**
- b) **Peaches and apricots**
- c) **Plums**
- d) **Cherries**
- e) **Grapes**
- f) **Blackberries and raspberries**
- g) **Strawberries**
- h) **Blueberries**
- i) **Gooseberries**

Bring in samples of common and uncommon fruits. Cut up the fruits and allow the students to sample them. Ask the students which fruits grow in Missouri.

Q4. What are the basic steps in planning a garden?

A4.
- a) **Select the site location and size.**
- b) **Decide what to grow.**
- c) **Draw a garden plan.**
- d) **Purchase seeds and plants.**
- e) **Prepare the soil.**
- f) **Plant the garden.**

Pass out seed catalogs for students to look through. Have them look at plant selection, prices, garden aides, etc. If possible, have enough seed catalogs for all students to keep.

Q5. What tools and equipment are needed to grow a home garden?

A5.
- a) **Hoe**
- b) **Rake**
- c) **Spade or spading fork**
- d) **Garden hose, watering can, or bucket**
- e) **Rototiller**

Bring in the common hand tools to demonstrate to the students. Let the students look them over and try them in a garden plot.

Q6. What is organic gardening?

A6.
- a) **Growing crops without chemicals**
- b) **Using biological control measures**
- c) **Using natural fertilizers**
  - 1) **Manure**
  - 2) **Compost**
  - 3) **Leaves**

Bring in samples of organic pest controls, such as predator insects and insecticidal soap, and discuss the differences in gardening with and without chemicals. Have students do AS 4.1 and 4.2. These activities may be done individually or in groups of two.

F. Other activities

1. Have all students transplant a tomato or an annual flower from a cell-pack to a 4" pot. Let the students take plants home to plant around their houses.

2. Have students break into groups of three. Allow the students to use seed catalogs, gardening books, and extension bulletins to assist them in designing a 10' x 10' garden. Have the students use plants hardy to Missouri.

3. Have the students make posters using fruit and vegetable catalogs. The posters could be collages, informational, or just for looks. Display the posters around the school or at the public library.

4. Let students help set up a garden display to inform people about gardening. It can be put in a vacant store front, a public building, a hardware store, or at the library. Include garden tools, garden plants, fresh produce, garden books, garden catalogs, garden supplies, etc. Local businesses may be willing to loan items for use in the display. Be sure to keep the plants or produce in good condition.

G. Conclusion

There are many fruits and vegetables commonly grown in Missouri. These plants require some planning before they are grown. When planning a garden or orchard you should decide what to grow, select the site, purchase seeds and plants, and start the work of gardening.

H. Competency

Explain the basic information needed to plan a garden or orchard.

Related Missouri Core Competencies and Key Skills: None

I. Answers to Unit Evaluation

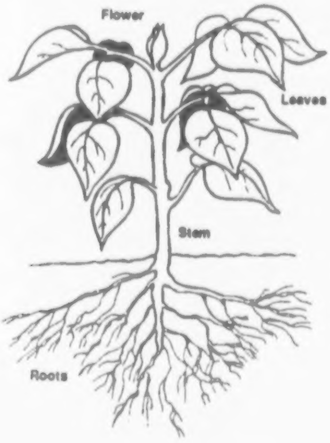
1.	d	(Lesson 1)
2.	c	(Lesson 1)
3.	c	(Lesson 1)
4.	b	(Lesson 2)
5.	b	(Lesson 2)
6.	c	(Lesson 2)
7.	d	(Lesson 2)
8.	a	(Lesson 2)
9.	d	(Lesson 2)
10.	d	(Lesson 2)
11.	a	(Lesson 2)
12.	c	(Lesson 2)
13.	a	(Lesson 3)
14.	b	(Lesson 3)
15.	c	(Lesson 3)
16.	d	(Lesson 3)
17.	a	(Lesson 3)
18.	b	(Lesson 4)
19.	d	(Lesson 4)
20.	a	(Lesson 4)
21.	c	(Lesson 4)

22. c (Lesson 1)
23. d (Lesson 1)
24. a (Lesson 1)
25. b (Lesson 1)
26. c (Lesson 2)
27. e (Lesson 2)
28. a (Lesson 2)
29. d (Lesson 2)
30. b (Lesson 2)

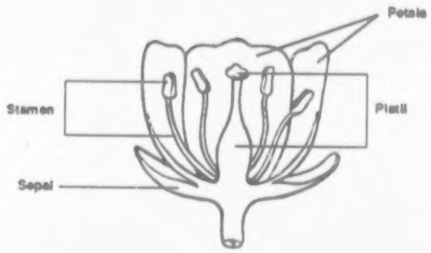
31. a. __4__ Purchase seeds and plants. (Lesson 4)
b. __6__ Plant the garden.
c. __1__ Select the site location and size.
d. __5__ Prepare the soil.
e. __3__ Draw a garden plan.
f. __2__ Decide what to grow.

32. Possible answers: provides food, beauty, oxygen, shelter, clothing, shade, cooling, wind control, reduces erosion, energy sources, wildlife habitat, a hobby, relaxation, and employment (Lesson 1)

33. (Lesson 2)



34. (Lesson 2)



35. Possible answers: save money, fresher produce, convenience and availability, enjoyment, sense of pride, and relaxation (Lesson 4)

J. Answers to Activity Sheets

The instructor needs to determine if students complete the activities in an appropriate manner.

UNIT III - PLANTS IN OUR ENVIRONMENT AS 4.1

Lesson 4: Fruit and Vegetable Gardening Name ____________

PLANTING A ROW OF SEEDS FOR A VEGETABLE GARDEN

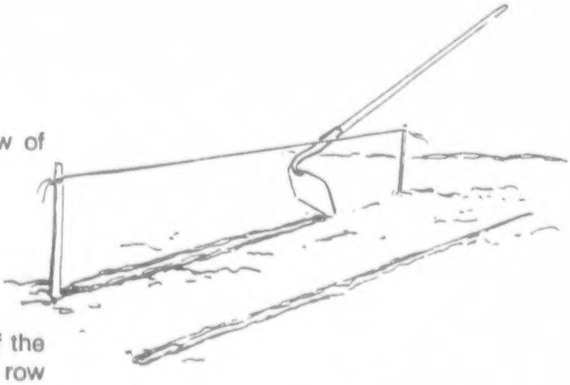
Objective: The student will be able to plant a row of seeds.

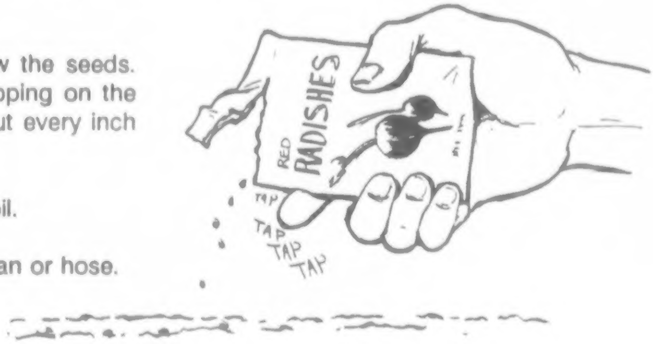
Materials:

Garden plot
Vegetable seeds (radish, turnips, lettuce)
2 stakes with string the length of the rows
Watering can or hose
Water

Procedure:

1. Watch the instructor demonstrate how to plant a row of seeds.
2. Select the package of seeds you want to plant.
3. Using two stakes and a string, line up a straight row.
4. Using the hoe, make a straight line with the corner of the tool. Try not to hit the string in the process, or your row may become crooked.
5. Open the seed package and prepare to sow the seeds. Spread the seeds into the row by gently tapping on the seed package. Space the seeds evenly about every inch apart for most smaller seeds.
6. Use the hoe to lightly cover the seeds with soil.
7. Water the seeds thoroughly with a watering can or hose.





Lesson 4: Fruit and Vegetable Gardening

Name ____________________

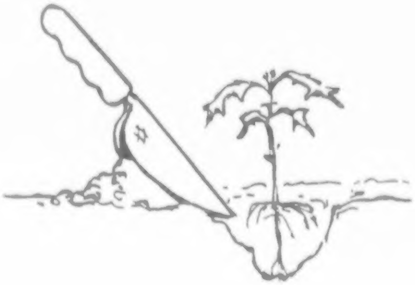
TRANSPLANTING PLANTS IN A VEGETABLE GARDEN

Objective: The student will be able to transplant a plant.

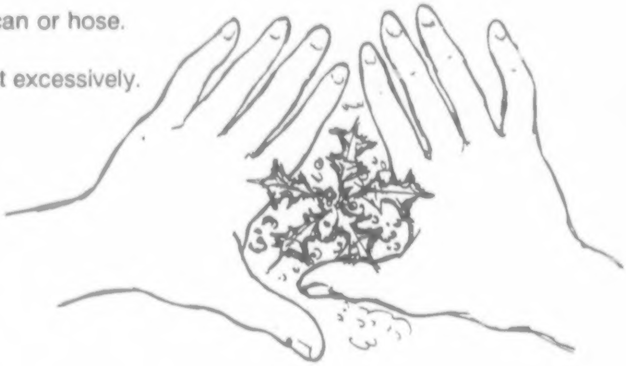
Materials:

Plants (tomato, cabbage, cauliflower, etc.) - Check with your instructor.
Hoe or trowel
Watering can or hose
Water

Procedure:



1. Watch the instructor demonstrate how to plant a transplant.
2. Select the transplants you want to plant.
3. Dig a hole deep enough to cover the roots of the transplant, using a trowel or hoe.
4. Gently remove the transplant from the container, being careful not to damage the roots.
5. Place the roots of the plant in the hole firming the soil back around them. Keep the plant as straight as possible.
6. Water the plants thoroughly with a watering can or hose.
7. Observe the plant and do not allow it to dry out excessively.



UNIT III - PLANTS IN OUR ENVIRONMENT

Name ____________________

Date ____________________

UNIT EVALUATION

Circle the letter that corresponds to the best answer.

1. What is the large scale production of plants for grain, forage, or fiber?

    a. Ornamental horticulture
    b. Nursery production
    c. Horticulture
    d. Agronomy

2. The production and marketing of fruits, vegetables, and ornamental plants is called ____________________.

    a. Ornamental horticulture
    b. Botany
    c. Horticulture
    d. Agronomy

3. Which of the following is a biological benefit provided by plants?

    a. Clothing
    b. Shade
    c. Oxygen
    d. All of the above

4. Which plant part is the major plant food producer?

    a. Root
    b. Leaf
    c. Stem
    d. Flower

5. Which plant part supports the plant and is a site of photosynthesis?

    a. Root
    b. Stem
    c. Leaf
    d. Flower

6. What is photosynthesis?

    a. The reproduction of plants
    b. The absorption of water and nutrients
    c. The process of food production for the plant
    d. The process of cooling the plant

7. How many elements are essential to plant growth?

   a. 13
   b. 10
   c. 12
   d. 16

8. Which factor is not essential for photosynthesis?

   a. Soil
   b. Light
   c. Water
   d. Carbon dioxide

9. What is an important quality about the soil?

   a. Provides a support for roots
   b. Allows water and air movement
   c. Stores nutrients
   a. All of the above.

10. What part of the plant is the site of sexual propagation?

   a. Stem
   b. Root
   c. Leaf
   d. Flower

11. Which of the following is not an asexual propagation method?

   a. Pollination
   b. Division
   c. Grafting
   d. Cuttings

12. Which of the following are the main parts of a flower?

   a. Petal, stem, pistil, and style
   b. Pistil, leaf, stem, and root
   c. Sepal, pistil, petal, and stamen
   d. Stamen, sepal, anther, and ovary

13. Which of the following are important factors to consider in caring for plants?

   a. Water, soil, fertilizer, and light
   b. Humidity, light, time, and beauty
   c. Color, soil, mood, and size
   d. None of the above

14. Pushing your finger into the soil is a general indicator for the need to ______________.

   a. Fertilize the plant
   b. Water the plant
   c. Shade the plant
   d. Control for pests

15. How does the care of houseplants differ from the care of outdoor plants?

   a. Houseplants require monthly watering.
   b. Outdoor plants require daily watering.
   c. Houseplants require regular watering.
   d. All of the above

16. How often do outdoor plants need fertilization?

   a. Every month
   b. Every two months
   c. Three times a year
   d. Only once a year

17. Which of the following are plant pest problems?

   a. Insects, diseases, and weeds
   b. Birds, frogs, and plaques
   c. Weeds, mammals, and heat
   d. Moles, snakes, and frogs

18. What vegetables are commonly grown in Missouri?

   a. Sweetcorn, squash, blueberries, and apples
   b. Cabbage, peas, turnips, and tomatoes
   c. Peppers, citrus, carrots, and watermelons
   d. Green beans, broccoli, lettuce, and cherries

19. What fruits are commonly grown in Missouri?

   a. Blackberries, grapes, cabbage, and pears
   b. Peppers, blueberries, nectarines, and Swiss chard
   c. Apricots, strawberries, peaches, and turnips
   d. Grapes, strawberries, apples, and raspberries

20. Which of the following are common garden tools?

   a. Hoe, rake, rototiller, and spade
   b. Shovel, tacker, budger, and spading fork
   c. Rototiller, watering can, rake, and pole pruner
   d. All of the above

21. What is the growing of garden plants without chemicals?

a. Standard gardening
b. Biodegradable gardening
c. Organic gardening
d. Chemless gardening

Match the word or words on the right that correspond best with the statement on the left.

____ 22. Growing trees for lumber and paper

____ 23. Fruits, vegetables, and ornamental plants

____ 24. Floral design, lawn care, and landscaping

____ 25. Provide food, fuel, and beauty

a. Horticultural career areas

b. Benefits of plants

c. Forestry

d. Horticultural plants

Match the word or words on the right that correspond best with the statement on the left.

____ 26. Female part of the flower

____ 27. Male part of the flower

____ 28. Transferred from the anther to stigma

____ 29. A product of photosynthesis

____ 30. Asexual propagation method

a. Pollen

b. Tissue culture

c. Pistil

d. Oxygen

e. Stamen

31. Place the six basic steps in planning a garden in the right order. Number one is the first step, and number six is the last step.

a. ________ Purchase seeds and plants.
b. ________ Plant the garden.
c. ________ Select the site location and size.
d. ________ Prepare the soil.
e. ________ Draw a garden plan.
f. ________ Decide what to grow.

Complete the following short answer questions.

32. Describe four ways in which horticulture affects our lives.

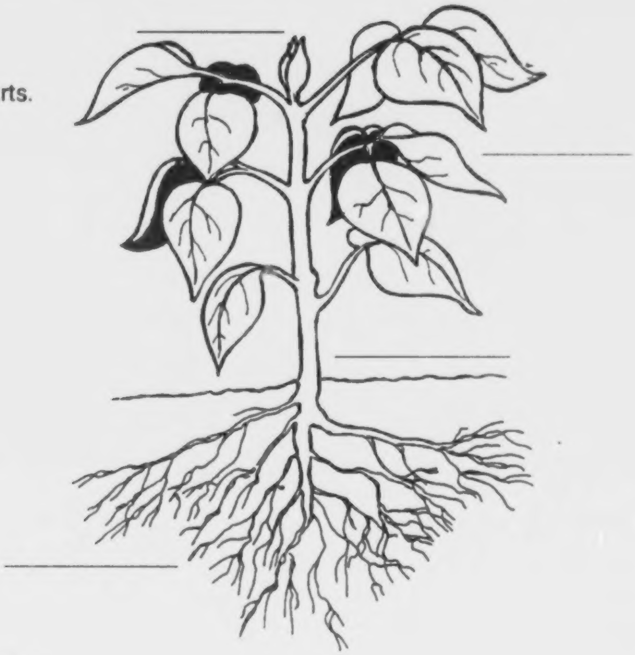
a.

b.

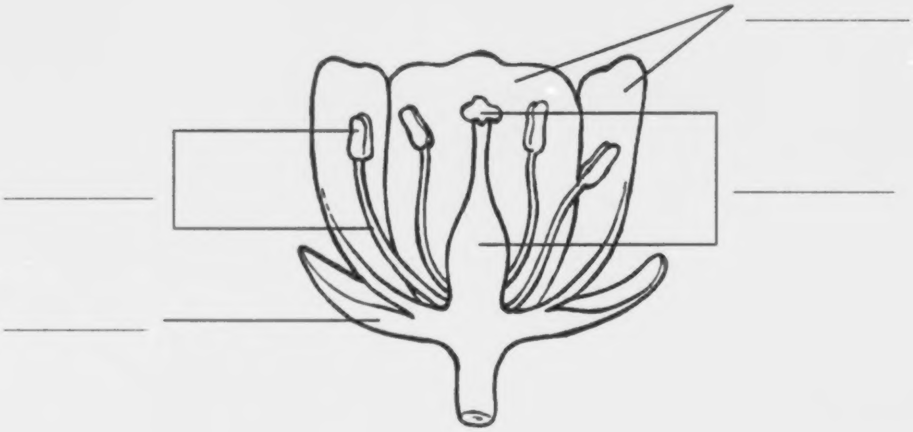
c.

d.

33. Label the four basic plant parts.



34. Label the four basic flower parts.



35. What are three reasons given by people wanting to grow gardens and orchards?

a.

b.

c.

UNIT IV - PRODUCTS FROM AGRICULTURE

Lesson 1: Agriculture in the Food Chain

Objective: The student will be able to describe the role of agriculture in the food chain.

Study Questions

1. **What is the food chain?**
2. **Why do people manipulate the food chain?**
3. **What is the role of agriculture in the food chain?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.
2. Transparency Masters
    a) TM 1.1: Natural Food Chain
    b) TM 1.2: Agricultural Food Chain
3. Activity Sheet
    a) AS 1.1: Food Sources

UNIT IV - PRODUCTS FROM AGRICULTURE

Lesson 1: Agriculture in the Food Chain

TEACHING PROCEDURES

A. Introduction

This lesson is about the food chain and how agricultural activities affect the process.

B. Motivation

Have students give examples of meals they have eaten. Write food items on the chalkboard. Categorize each food item as a plant or animal product.

Review each food item listed and identify those which can be eaten by humans or animals. List other uses of the product. Use AS 1.1.

EXAMPLE: Milk, steak, potatoes, green beans, tomatoes, salad, and apple pie.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is the food chain?

A1. The food chain is a sequence of organisms in which each member of the chain feeds on the member below and is consumed by a member above.

Ask students to give an example of a food chain. Use TM 1.1. In nature, lower animal forms are consumed by higher animal forms. Ultimately, consumption by humans, the highest animal form, is the end of the food chain. Garbage and waste products are then consumed by bacteria, etc., and the food chain process begins again.

Q2. Why do people manipulate the food chain?

A2. Humans cannot survive by only using food produced by the natural food chain.

Ask students why people alter the food chain. Discuss why natural food chains can no longer provide the food that people need. Manipulation of the food chains allows farmers to produce more food in a shorter amount of time than would be possible naturally.

Q3. What is the role of agriculture in the food chain?

A3.
- **a) Large-scale production of food crops**
- **b) Domestication of animals for food**
- **c) People manipulate the environment to increase food production**

Discuss the role of agriculture in the food chain. As the human population increases, the need for food increases as well. Agricultural practices enable people to produce larger amounts of food than would be produced naturally in the food chain. Use TM 1.2. Agriculture strives to maximize positive environmental factors (e.g., fertilizers, confinement housing, and vaccinations) while minimizing adverse factors (e.g., competition from weeds, weather conditions, and diseases).

F. Other activities

1. Have students create their own diagram of a food chain. Draw arrows to show all interrelationships.
2. Have students list as many food products as they can, categorizing them into plant or animal products. Also, list as many producers and consumers of these products as possible.

G. Conclusion

In the natural environment, there are many food chains. People have learned through experience and technology how to manipulate the food chain for their benefit. Agriculture manipulates natural food chains to increase the production of food for humans.

H. Competency

Describe the role of agriculture in the food chain.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

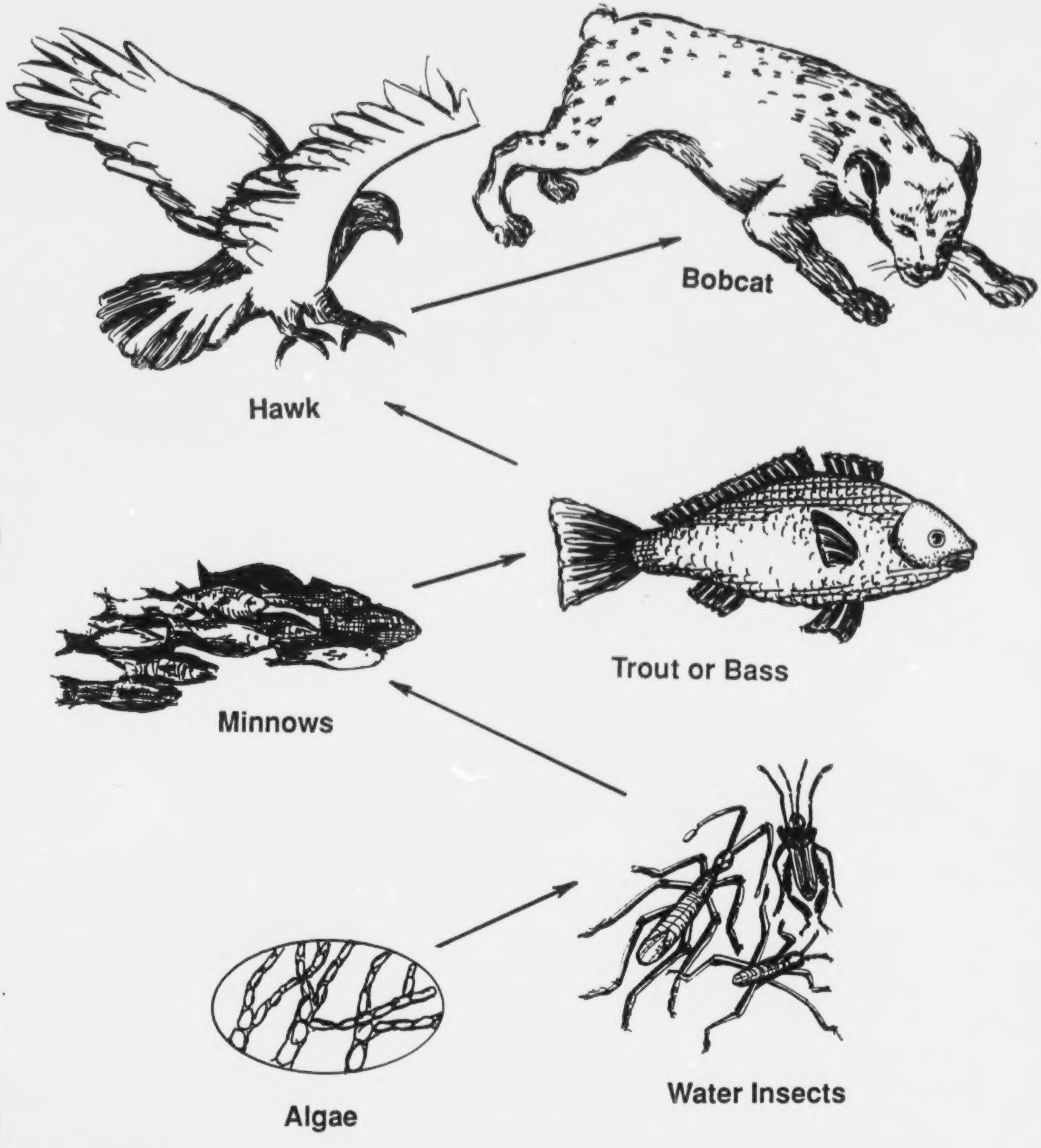
A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 1.1 - Food Sources

FOOD ITEM	SOURCE	ADDITIONAL FOOD PRODUCTS
Milk	dairy cows	cottage cheese, cheese, whipping cream
Steak	beef cattle	hamburger, roasts, stew meat, liver
Mashed potatoes	root of potato plant	potato chips, shoestring potatoes, french fries
Green beans	green bean plants	casseroles, salads, frozen, canned, fresh
Tomatoes	tomato vines	vinegar, ketchup, soups
Apple pie	apple trees	apple sauce, spiced apples, apple cider

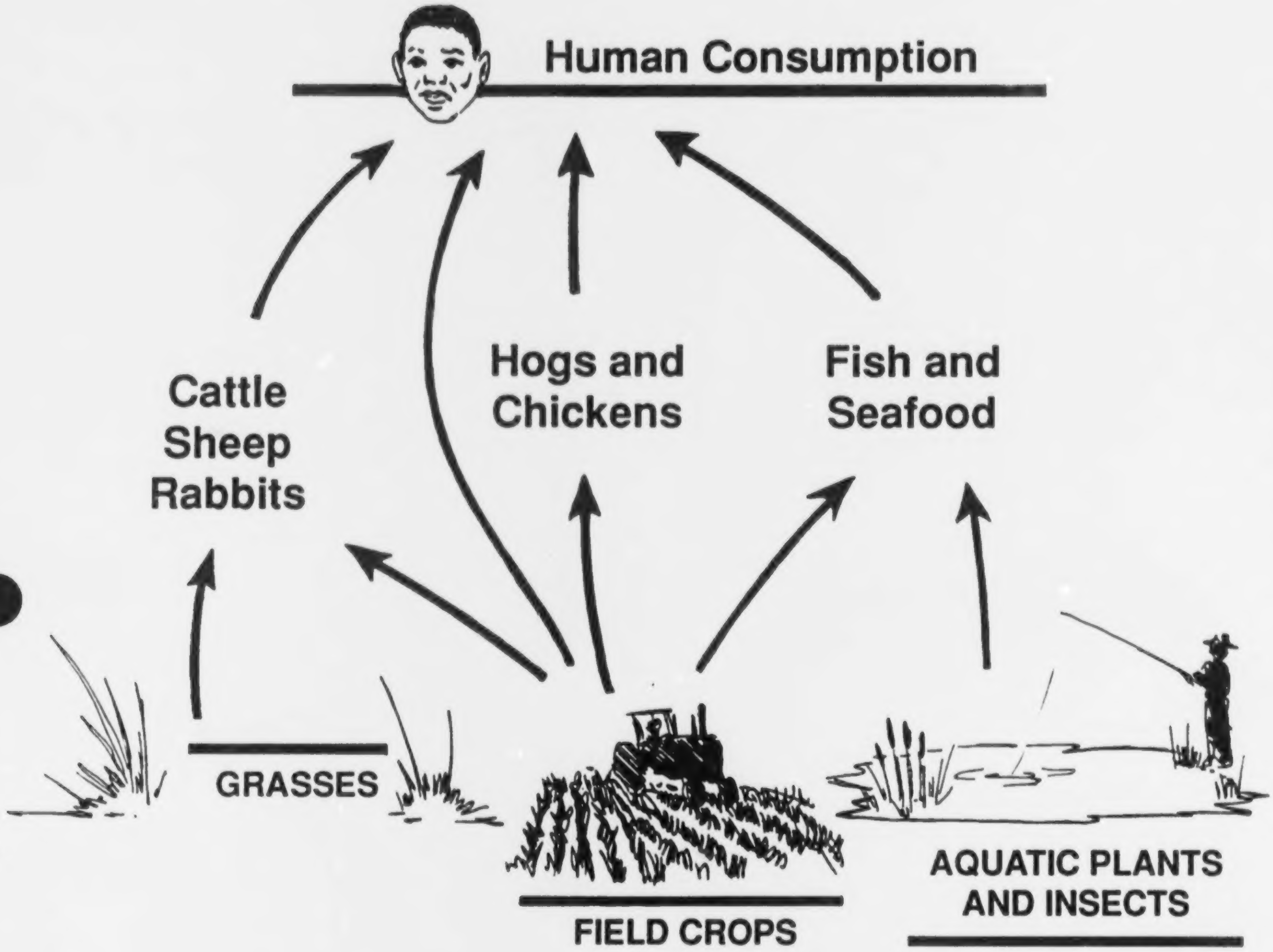
TM 1.1

Natural Food Chain


Bobcat
Hawk
Trout or Bass
Minnows
Water Insects
Algae

TM 1.2

Agricultural Food Chain


Human Consumption
Cattle
Sheep
Rabbits
Hogs and
Chickens
Fish and
Seafood
GRASSES
FIELD CROPS
AQUATIC PLANTS
AND INSECTS

Lesson 1: Agriculture in the Food Chain

Name ________________

FOOD SOURCES

Objective: The student will be able to identify food sources for selected foods.

For each food item listed below, identify the source of the item and other products that may be produced by the source. One has been completed for you.

FOOD ITEM	SOURCE	ADDITIONAL FOOD PRODUCTS
Milk		
Steak		
Mashed potatoes		
Green beans		
Tomatoes		
Apple pie		

UNIT IV - PRODUCTS FROM AGRICULTURE

Lesson 2: Food Groups

Objective: The student will be able to identify the four major food groups and examples of foods in each group.

Study Questions

1. **What are three benefits of a balanced diet?**
2. **What are the four major food groups in a balanced diet?**
3. **What are the primary nutrients in each food group?**
4. **What are examples of foods in each group?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.
2. Transparency Master
    - a) TM 2.1: Food Groups
3. Activity Sheet
    - a) AS 2.1: Food Groups

Lesson 2: Food Groups

TEACHING PROCEDURES

A. Review

There are many food chains in the natural environment. People in agriculture have learned to manipulate the food chains to produce larger amounts of food than would be produced naturally.

B. Motivation (Select one.)

1. Bring in samples of foods from all of the food groups and have the students look them over and decide how they should be classified. Describe the different ways to group them.

2. Write the school lunch menu on the chalkboard. Have students divide the lunch into the four food groups. Discuss students' responses.

C. Assignment

D. Supervised study

E. Discussion

Q1. **What are three benefits of a balanced diet?**

A1. **a) Good health**
b) Disease resistance
c) Proper growth and development

Bring in pictures of people who look healthy and those with nutrient deficiencies (e.g., malnutrition, calcium deficiency, and vitamin deficiencies). Discuss the benefits of a balanced diet.

Q2. **What are the four major food groups in a balanced diet?**

A2. **a) Meat and meat alternatives**
b) Fruits and vegetables
c) Grains
d) Milk and milk products

Ask students to explain how they grouped the foods during the motivation discussion and have them give the four correct food groups. Point out that many foods do not fit into one of the four groups. Many of these foods are considered "junk food" because they are high in sugar and/or calories but low in nutrients (e.g., soda, candy, cookies, and potato chips). Some foods such as spices, tea, and coffee also fall in the other category because they have little nutritional value. Have students complete AS 2.1.

Q3. **What are the primary nutrients in each food group?**

A3.
- a) **Meat and meat alternatives are high in protein.**
- b) **Fruits and vegetables contain vitamins and fiber.**
- c) **Grains are high in carbohydrates (energy) and fiber.**
- d) **Milk and milk products contain protein, vitamins, and minerals (calcium, riboflavin, and vitamin A).**

Using the samples from the motivation, classify the foods in the four major food groups. Have students explain how the foods are similar. Each has unique characteristics that distinguishes it from another group.

Q4. **What are examples of foods in each group?**

A4.
- a) **Meat and meat alternatives group**
    - 1) **Meats - beef, fish, lamb, pork, and poultry**
    - 2) **Eggs**
    - 3) **Legumes - soybeans, dried peas, and dried beans**
    - 4) **Nuts and peanut butter**
- b) **Fruit and vegetable group**
    - 1) **Tree fruits - apples, cherries, oranges, and peaches**
    - 2) **Small fruits - grapes, raspberries, and strawberries**
    - 3) **Vine crops - squash and watermelons**
    - 4) **Root crops - carrots, onions, radishes, and potatoes**
    - 5) **Other crops - okra, peppers, and broccoli**
- c) **Grain group**
    - 1) **Breads including rolls and muffins**
    - 2) **Breakfast cereals**
    - 3) **Noodles and pasta**
    - 4) **Rice**
- d) **Milk and milk products group**
    - 1) **Milk - whole, skim, and evaporated**
    - 2) **Ice cream and ice milk**
    - 3) **Cheese and cottage cheese**
    - 4) **Yogurt**

Ask students to name examples of foods in each food group. Point out that many food items do not fit under any of the four groups. See list below for examples.

Fats - butter, lard, margarine, and vegetable oil
Beverages - coffee, pop, and tea
Sugar and sweeteners - sugar cane, sugar beets, Nutrasweet®, and Saccharine®
Herbs and spices - salt, pepper, oregano
Cakes, cookies, pies, and donuts

F. Other activities

1. Have students conduct an inventory of their home pantries and identify all the products they can find that are made from soybeans.

2. Have students cut pictures from magazines and make a collage depicting each of the four food groups.

3. Bring in several unusual foods. Have students classify them and determine the nutritional value from the labels.

4. Have a nutritionist come to class to talk about nutrition, health, and the four food groups.

5. Bring in food items from each food group and prepare a meal for the class.

G. Conclusion

Foods from each of the four major food groups are essential to maintain healthy bodies. The four major food groups are meat and meat alternatives; fruits and vegetables; grains; and milk and milk products. These foods provide important nutrients needed by the human body. Some foods lack significant nutritional value such as soda, potato chips, and cookies and should be limited in the diet.

H. Competency

Identify the four major food groups and examples of foods in each group.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

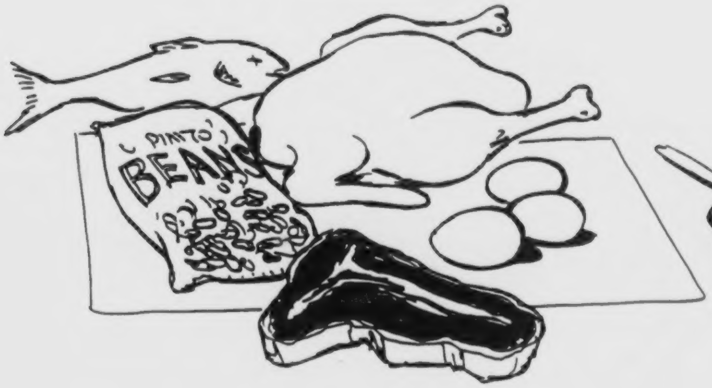
J. Answers to AS 2.1 - Food Groups

Grains	**Meat and Meat Alternatives**	**Fruits and Vegetables**
macaroni	steak	watermelon
spaghetti	shellfish	apricots
wheat bread	pork chops	cabbage
rice	peanuts	squash
cornmeal	hot dogs	grapefruit

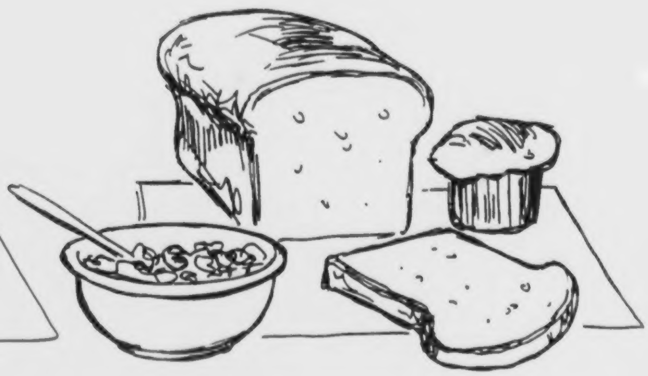
Milk and Milk Products	**Other (includes junk foods)**
skim milk	cupcakes
cheddar cheese	margarine
ice cream	potato chips
cottage cheese	cookies
yogurt	vegetable oil

TM 2.1

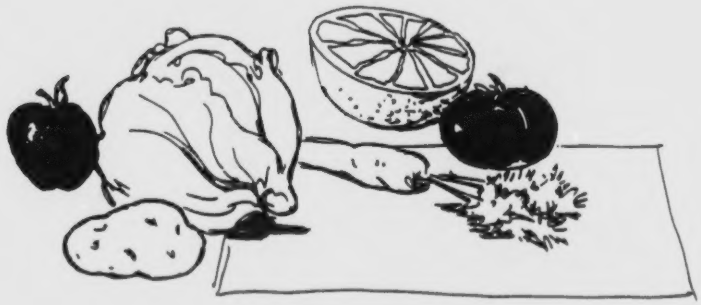
Food Groups


PINTO
BEANS

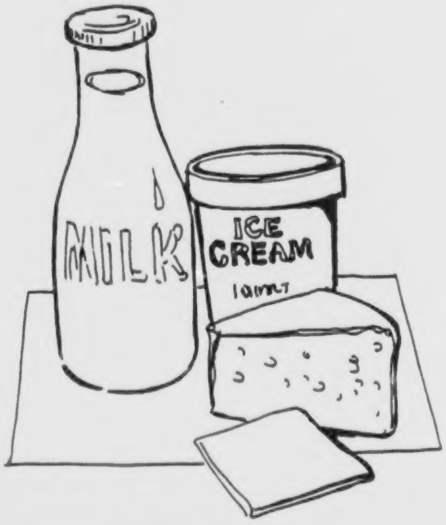
Meat and Meat Alternatives



Grains



Fruits and Vegetables


MILK
ICE CREAM

Milk and Milk Products

Lesson 2: Food Groups

Name__________________

FOOD GROUPS

Objective: The student will be able to classify foods by the food groups.

Write the name of the item in the food list at the bottom of the page under the appropriate food group.

Grains	**Meat and Meat Alternatives**	**Fruits and Vegetables**
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________
________________	________________	________________

Milk and Milk Products	**Other (includes junk foods)**
____________________________	____________________________
____________________________	____________________________
____________________________	____________________________
____________________________	____________________________
____________________________	____________________________

Food List

skim milk
cupcakes
steak
shellfish
macaroni
watermelon
cheddar cheese
spaghetti
wheat bread
pork chops
ice cream
cottage cheese
apricots
peanuts
cabbage
yogurt
margarine
squash
rice
potato chips
grapefruit
cookies
cornmeal
vegetable oil
hot dogs

UNIT IV - PRODUCTS FROM AGRICULTURE

Lesson 3: Food Products from Plants

Objective: The student will be able to identify food products from plants.

Study Questions

1. **What food products come from grain?**
2. **What food products come from vegetables?**
3. **What food products come from fruits?**
4. **What food products come from other plants?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.
2. Activity Sheet
   a) AS 3.1: Food Inventory

Lesson 3: Food Products from Plants

TEACHING PROCEDURES

A. Review

The human body requires many nutrients to help maintain good health. Items from each of the four major food groups are essential to provide these nutrients. The four major food groups are meat and meat alternatives; fruits and vegetables; grains; and milk and milk products.

B. Motivation (Select one.)

1. Bring in several examples of products produced from plants such as fresh produce, canned fruits or vegetables, or other processed foods from plants. Ask students to identify the products and where they are produced.

2. Bring in several (5-7) fresh vegetables (e.g., green bean, broccoli, cauliflower, brussels sprouts, and spinach). Encourage students to taste the raw vegetables. The next day have the vegetables cooked for students to taste. Discuss the students' reactions.

C. Assignment

D. Supervised study

E. Discussion

Q1. What food products come from grains?

A1.
a) Flour
b) Cereals
c) Cooking oils
d) Sweeteners
e) Pasta
f) Soybeans and soybean meal
g) Snack chips and crackers
h) Popcorn
i) Starch
j) Dextrose

Bring in and discuss samples of grains grown in the area and some products produced from those grains. Ask students to think of other products made from locally produced grains.

Q2. What food products come from vegetables?

A2.
a) Fresh vegetables
b) Canned vegetables
c) Frozen vegetables
d) Vegetable juices
e) Soups

Bring in a variety of food items that contain vegetables and have the students identify the vegetables on the list of ingredients. Discuss the vegetables in those products and other products.

Q3. What food products come from fruits?

A3.
- **a) Fresh fruit**
- **b) Canned fruit**
- **c) Frozen fruit**
- **d) Dried fruit**
- **e) Fruit juices**
- **f) Jams and jellies**

Ask students to discuss what products are processed from fruits. Bring in various dried fruits and have students try to identify them. The dried fruits could then be eaten by the students.

Q4. What food products come from other plants?

A4.
- **a) Maple syrup**
- **b) Herbs**
- **c) Chocolate**
- **d) Nuts**
- **e) Mustard**
- **f) Tea**
- **g) Coffee**
- **h) Spices**

Divide the class into groups of three or four students. Have them brainstorm other food products that come from plants. Students may think of products that are not listed above. Use AS 3.1.

F. Other activities

1. Have students inventory foods served in school lunches for a week to determine which foods came from plants or have plant products in them.

2. Have students make a list of grains, vegetables, and fruits that are grown in the area.

3. Bring in samples of fruits and vegetables to taste in class.

G. Conclusion

Foods processed from plants make up a large portion of the human diet. Foods of plant origin come from grains, vegetables, fruits, and other plants.

H. Competency

Identify food products from plants.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 3.1 - Food Inventory

The instructor will need to determine if answers are categorized properly.

UNIT IV - PRODUCTS FROM AGRICULTURE AS 3.1

Lesson 3: Food Products from Plants Name________________

FOOD INVENTORY

Objective: The student will be able to identify food products from grains, vegetables, fruits, and other plants.

Look on the kitchen shelves at home or at the grocery store. Identify ten food products in each of the following categories.

Grains	Vegetables	Fruits	Other Plants

UNIT IV - PRODUCTS FROM AGRICULTURE

Lesson 4: Food Products from Animals

Objective: The student will be able to identify food products from animals.

Study Questions

1. **What are some foods that come from meat animals?**
2. **What are some foods that come from poultry animals?**
3. **What are some foods that come from dairy animals?**
4. **What are some examples of fish and seafoods?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.

2. Handouts

    a) HO 4.1: Beef Chart
    b) HO 4.2: Pork Chart
    c) HO 4.3: Lamb Chart

3. Activity Sheets

    a) AS 4.1: Animal Food Products
    b) AS 4.2: Processing Whipped Cream and Butter

TEACHING PROCEDURES

A. Review

Many foods eaten by Americans are produced from plants. They are essential for a balanced diet. However, a number of food products are also produced from animals.

B. Motivation (Select one.)

1. Bring in samples of a variety of luncheon meats and have students try to distinguish between different types of meat.
2. Bring in ground turkey and ground beef. Cook small samples so students can do a taste test between the two. Also, ham could be compared with turkey ham.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are some foods that come from meat animals?

A1.
- **a) Beef - cattle**
  - **1) Hamburger**
  - **2) Steak**
  - **3) Roast**
- **b) Veal - young cattle**
- **c) Pork - hogs**
  - **1) Pork chops**
  - **2) Ham**
  - **3) Bacon**
- **d) Lamb - sheep**
  - **1) Lamb chops**
  - **2) Leg of lamb**
- **e) Rabbit**
- **f) Processed meats**
  - **1) Luncheon meats**
  - **2) Hot dogs**

Distribute copies of HO 4.1, HO 4.2, and HO 4.3 to students and discuss the common cuts of meats that come from each animal. Have students complete AS 4.1.

Q2. What are some foods that come from poultry animals?

A2.
- **a) Eggs**
- **b) Meat (chicken, turkey, duck, goose, etc.)**
- **c) Processed patties and nuggets**

Ask students to discuss what foods come from poultry.

Q3. What are some foods that come from dairy animals?

A3.
- a) **Milk**
- b) **Cheese**
- c) **Ice cream**
- d) **Yogurt**
- e) **Sour cream**
- f) **Cottage cheese**
- g) **Butter**

Bring in samples of butter and margarine. Conduct a taste test to see if students can tell the difference between the two products. Have students do AS 4.2. This can be a group activity or an individual student activity.

Q4. What are some examples of fish and seafoods?

A4.
- a) **Fish**
  - 1) **Catfish**
  - 2) **Trout**
  - 3) **Bass**
  - 4) **Tuna**
  - 5) **Salmon**
  - 6) **Halibut**
  - 7) **Cod**
  - 8) **Shark**
- b) **Seafood**
  - 1) **Lobster**
  - 2) **Crabs**
  - 3) **Oysters**
  - 4) **Scallops**
  - 5) **Shrimp**
  - 6) **Clams**

Ask students to identify fish and seafood they have eaten. List suggestions on the board. Ask students to describe their experiences in catching some of the fish and/or seafood they identified.

F. Other activities

1. Conduct a cooking/tasting day with a variety of meats and fish.
2. Visit a farm to observe how livestock are raised.
3. Write to livestock breed associations and ask for additional information on the meat characteristics of each breed.
4. Tour a grocery store meat department or packing plant to observe meat processing activities.

G. Conclusion

A wide variety of food products come from animals. Animals provide humans with high protein foods such as meat, eggs, dairy products, fish, and seafoods.

H. Competency

Identify foods from animals.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

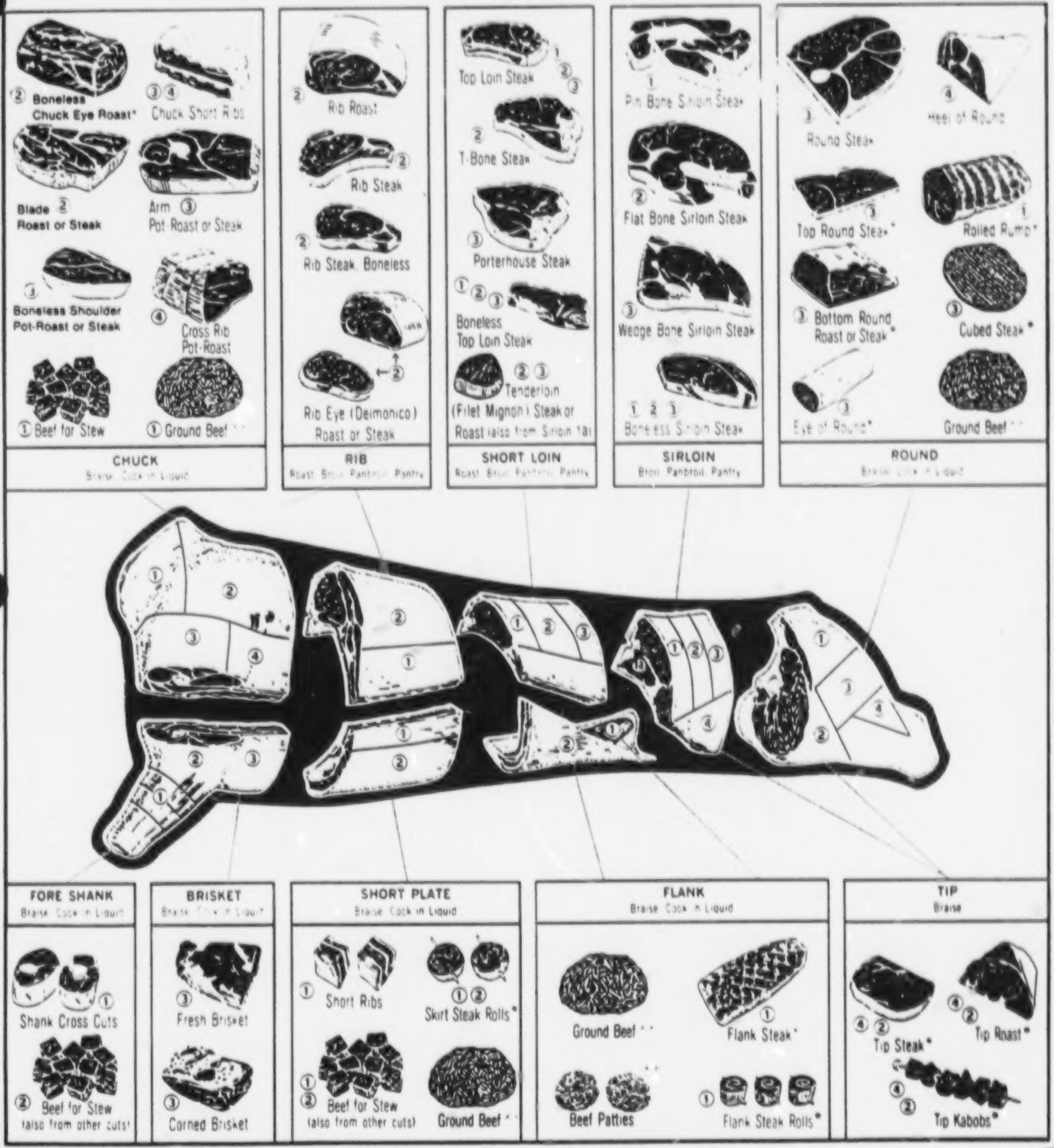
AS 4.1 - Animal Food Products

CUT OF MEAT	TYPE OF MEAT ANIMAL		
	BEEF	PORK	SHEEP
1. Bacon		X	
2. Sirloin steak	X		
3. T-bone steak	X		
4. Lamb chops			X
5. Filet mignon	X		
6. Loin chop		X	X
7. Kabobs	X		X
8. Flank steak	X		
9. Rump roast	X		
10. Sausage		X	
11. Rib steak	X		
12. Fresh arm picnic		X	
13. Tenderloin	X	X	
14. Round steak	X		
15. Ham slice		X	
16. Loin roast		X	
17. Shoulder steak	X		
18. Leg of lamb			X
19. Short ribs	X		
20. Blade steak	X	X	

AS 4.2 - Processing Whipped Cream and Butter
There are no answers for this activity.

Beef Chart

RETAIL CUTS OF BEEF — WHERE THEY COME FROM AND HOW TO COOK THEM


② Boneless Chuck Eye Roast*
③④ Chuck Short Ribs
Blade ② Roast or Steak
Arm ③ Pot-Roast or Steak
③ Boneless Shoulder Pot-Roast or Steak
④ Cross Rib Pot-Roast
① Beef for Stew
① Ground Beef**
CHUCK
Braise, Cook in Liquid
② Rib Roast
Rib Steak ②
② Rib Steak, Boneless
Rib Eye (Delmonico) Roast or Steak ②
RIB
Roast, Broil, Panbroil, Panfry
Top Loin Steak ①②③
② T-Bone Steak
③ Porterhouse Steak
①②③ Boneless Top Loin Steak
②③ Tenderloin (Filet Mignon) Steak or Roast (also from Sirloin ①)
SHORT LOIN
Roast, Broil, Panbroil, Panfry
① Pin Bone Sirloin Steak
② Flat Bone Sirloin Steak
③ Wedge Bone Sirloin Steak
①②③ Boneless Sirloin Steak
SIRLOIN
Broil, Panbroil, Panfry
③ Round Steak
④ Heel of Round
Top Round Steak* ③
Rolled Rump* ①
③ Bottom Round Roast or Steak*
③ Cubed Steak*
Eye of Round* ③
Ground Beef**
ROUND
Braise, Cook in Liquid
①
②
③
④
FORE SHANK
Braise, Cook in Liquid
① Shank Cross Cuts
② Beef for Stew (also from other cuts)
BRISKET
Braise, Cook in Liquid
③ Fresh Brisket
③ Corned Brisket
SHORT PLATE
Braise, Cook in Liquid
① Short Ribs
①② Skirt Steak Rolls*
①② Beef for Stew (also from other cuts)
Ground Beef**
FLANK
Braise, Cook in Liquid
Ground Beef**
① Flank Steak*
Beef Patties**
① Flank Steak Rolls*
TIP
Braise
④② Tip Steak*
④② Tip Roast*
④② Tip Kabobs*

*May be Roasted, Broiled, Panbroiled or Panfried from high quality beef.
**May be Roasted, (Baked), Broiled, Panbroiled or Panfried.

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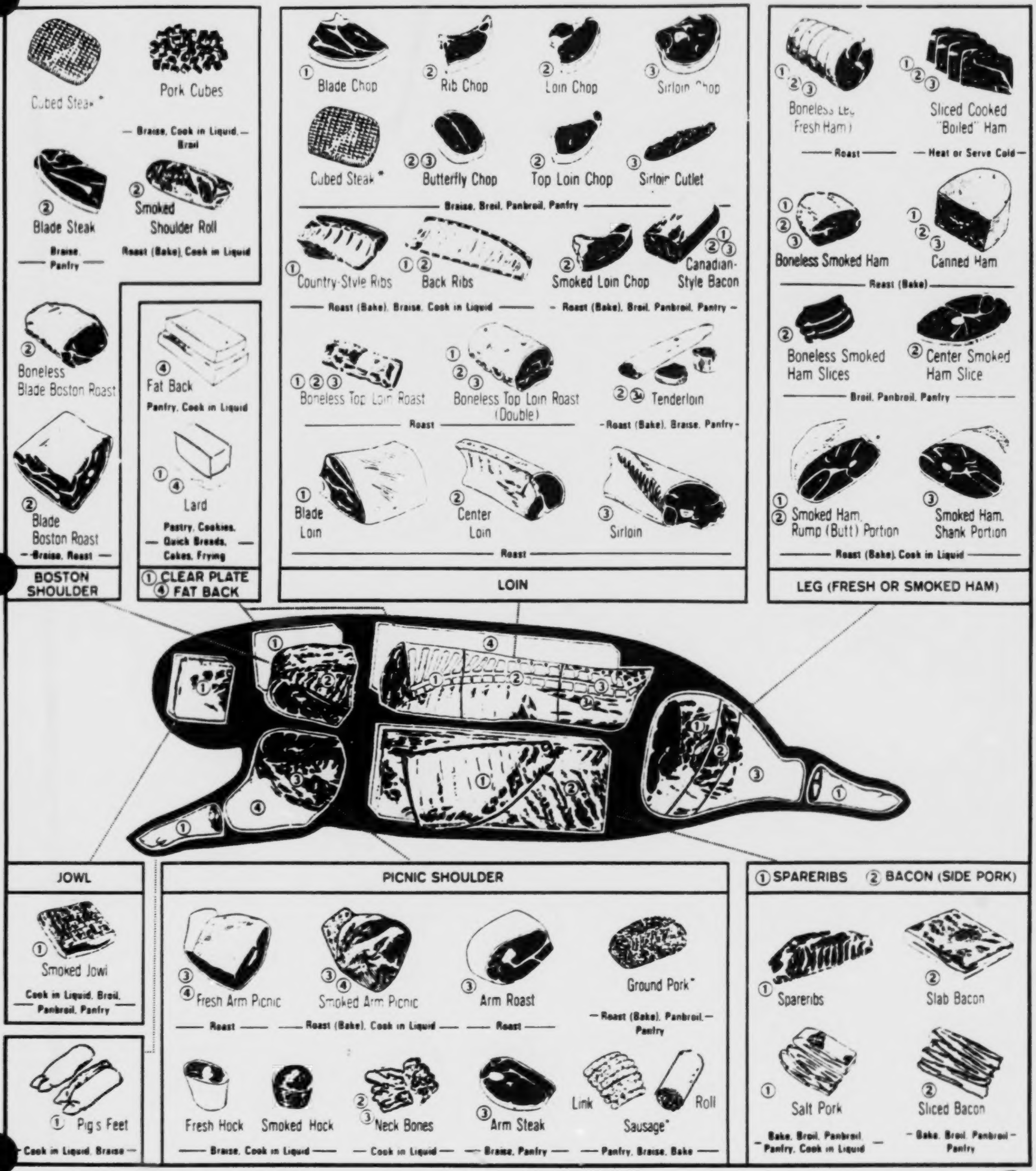
Source: **Uniform Retail Meat Identity Standards**, National Live Stock and Meat Board

Pork Chart

RETAIL CUTS OF PORK — WHERE THEY COME FROM AND HOW TO COOK THEM


Cubed Steak*
Pork Cubes
— Braise, Cook in Liquid, — Broil
② Blade Steak
Braise, Panfry
② Smoked Shoulder Roll
Roast (Bake), Cook in Liquid
② Boneless Blade Boston Roast
② Blade Boston Roast
— Braise, Roast —
BOSTON SHOULDER
④ Fat Back
Panfry, Cook in Liquid
① ④ Lard
Pastry, Cookies, Quick Breads, Cakes, Frying
① CLEAR PLATE
④ FAT BACK
① Blade Chop
② Rib Chop
② Loin Chop
③ Sirloin Chop
Cubed Steak*
②③ Butterfly Chop
② Top Loin Chop
③ Sirloin Cutlet
Braise, Broil, Panbroil, Panfry
① Country-Style Ribs
①② Back Ribs
Roast (Bake), Braise, Cook in Liquid
② Smoked Loin Chop
①②③ Canadian-Style Bacon
Roast (Bake), Broil, Panbroil, Panfry
①②③ Boneless Top Loin Roast
①②③ Boneless Top Loin Roast (Double)
Roast
②③ Tenderloin
Roast (Bake), Braise, Panfry
① Blade Loin
② Center Loin
③ Sirloin
Roast
LOIN
①②③ Boneless Leg (Fresh Ham)
Roast
①②③ Sliced Cooked "Boiled" Ham
Heat or Serve Cold
①②③ Boneless Smoked Ham
①②③ Canned Ham
Roast (Bake)
② Boneless Smoked Ham Slices
② Center Smoked Ham Slice
Broil, Panbroil, Panfry
①② Smoked Ham, Rump (Butt) Portion
③ Smoked Ham, Shank Portion
Roast (Bake), Cook in Liquid
LEG (FRESH OR SMOKED HAM)
①
②
④
③
①
④
②
③
①
②
③
①
③
④
①
②
JOWL
① Smoked Jowl
Cook in Liquid, Broil, Panbroil, Panfry
① Pig's Feet
Cook in Liquid, Braise
PICNIC SHOULDER
③④ Fresh Arm Picnic
Roast
③④ Smoked Arm Picnic
Roast (Bake), Cook in Liquid
③ Arm Roast
Roast
Ground Pork*
Roast (Bake), Panbroil, Panfry
Fresh Hock
Smoked Hock
Braise, Cook in Liquid
②③ Neck Bones
Cook in Liquid
③ Arm Steak
Braise, Panfry
Link
Roll
Sausage*
Panfry, Braise, Bake
① SPARERIBS
② BACON (SIDE PORK)
① Spareribs
② Slab Bacon
① Salt Pork
Bake, Broil, Panbroil, Panfry, Cook in Liquid
② Sliced Bacon
Bake, Broil, Panbroil, Panfry

*May be made from Boston Shoulder, Picnic Shoulder, Loin or Leg

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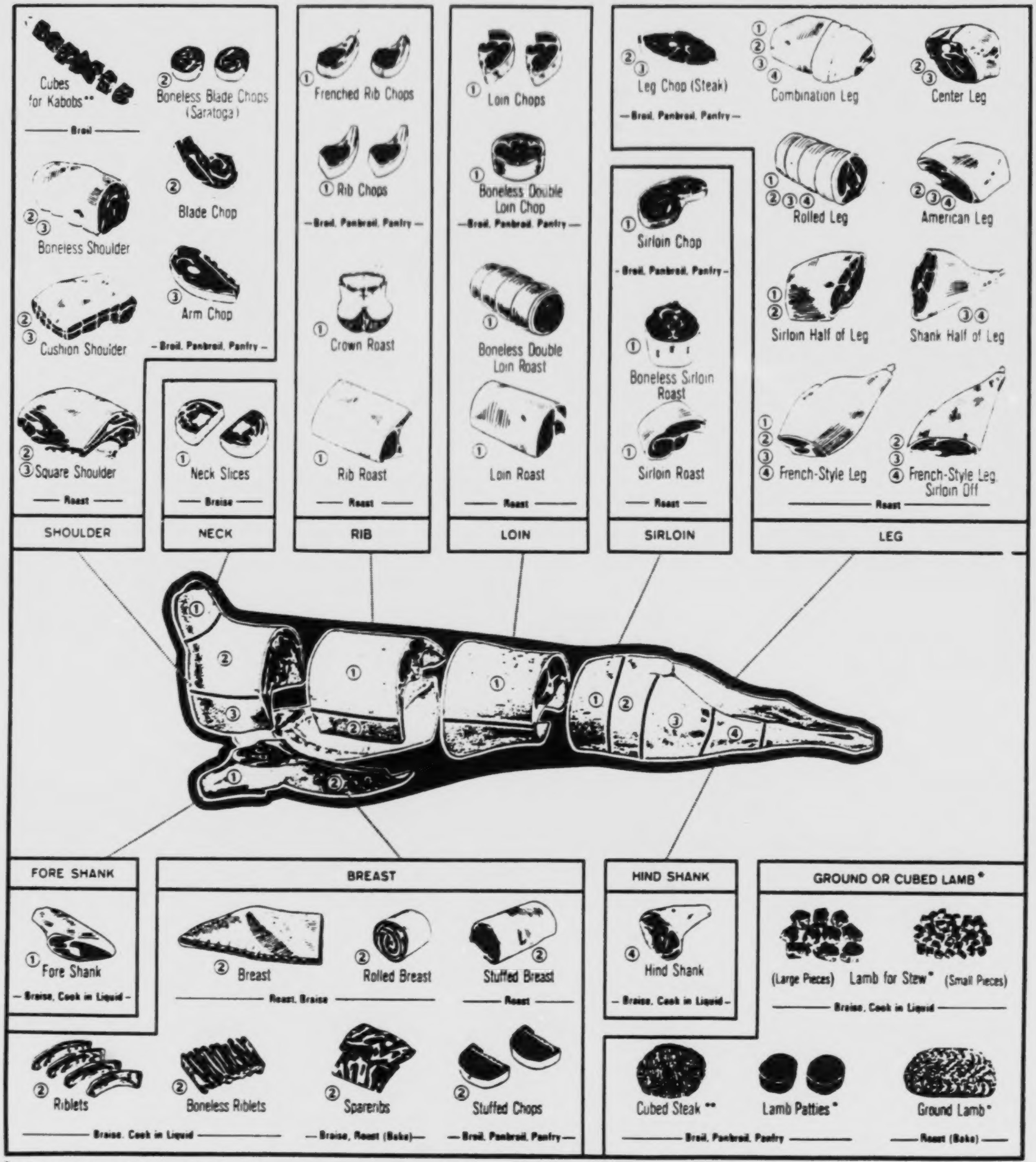
Source: **Uniform Retail Meat Identity Standards**, National Live Stock and Meat Board

Lamb Chart

RETAIL CUTS OF LAMB — WHERE THEY COME FROM AND HOW TO COOK THEM


Cubes for Kabobs**
Broil
② Boneless Blade Chops (Saratoga)
②③ Boneless Shoulder
② Blade Chop
③ Arm Chop
②③ Cushion Shoulder
Broil, Panbroil, Panfry
②③ Square Shoulder
Roast
SHOULDER
① Neck Slices
Braise
NECK
① Frenched Rib Chops
① Rib Chops
Broil, Panbroil, Panfry
① Crown Roast
① Rib Roast
Roast
RIB
① Loin Chops
① Boneless Double Loin Chop
Broil, Panbroil, Panfry
① Boneless Double Loin Roast
① Loin Roast
Roast
LOIN
①② Leg Chop (Steak)
Broil, Panbroil, Panfry
① Sirloin Chop
Broil, Panbroil, Panfry
① Boneless Sirloin Roast
① Sirloin Roast
Roast
SIRLOIN
①②③④ Combination Leg
②③ Center Leg
①②③④ Rolled Leg
②③④ American Leg
①② Sirloin Half of Leg
③④ Shank Half of Leg
①②③④ French-Style Leg
②③④ French-Style Leg, Sirloin Off
Roast
LEG
①
②
③
①
②
①
①
②
③
④
①
②
FORE SHANK
① Fore Shank
Braise, Cook in Liquid
BREAST
② Breast
② Rolled Breast
Roast, Braise
② Stuffed Breast
Roast
② Riblets
② Boneless Riblets
Braise, Cook in Liquid
② Spareribs
Braise, Roast (Bake)
② Stuffed Chops
Broil, Panbroil, Panfry
HIND SHANK
④ Hind Shank
Braise, Cook in Liquid
GROUND OR CUBED LAMB*
(Large Pieces) Lamb for Stew* (Small Pieces)
Braise, Cook in Liquid
Cubed Steak**
Lamb Patties*
Broil, Panbroil, Panfry
Ground Lamb*
Roast (Bake)

* Lamb for stew or grinding may be made from any cut

** Kabobs or cube steaks may be made from any thick solid piece of boneless Lamb

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Lesson 4: Food Products from Animals

Name ____________________

ANIMAL FOOD PRODUCTS

Objective: The student will be able to identify the type of meat animal that produces various cuts of meat.

Using HO 4.1, HO 4.2, and HO 4.3, place a check in the box to identify the type of meat animal that produces the cut of meat. Certain cuts of meat can come from more than one meat animal.

CUT OF MEAT	TYPE OF MEAT ANIMAL		
	BEEF	PORK	SHEEP
1. Bacon			
2. Sirloin steak			
3. T-bone steak			
4. Lamb chops			
5. Filet mignon			
6. Loin chop			
7. Kabobs			
8. Flank steak			
9. Rump roast			
10. Sausage			
11. Rib steak			
12. Fresh arm picnic			
13. Tenderloin			
14. Round steak			
15. Ham slice			
16. Loin roast			
17. Shoulder steak			
18. Leg of lamb			
19. Short ribs			
20. Blade steak			

Lesson 4: Food Products from Animals

Name ___________________

PROCESSING WHIPPED CREAM AND BUTTER

Objective: The student will be able to make whipped cream and butter from cream.

Materials:

1/2 pint of cream (in store container)
salt
crackers

Procedure:

1. Shake container for 10 minutes.
2. Open the container to see if the cream has become whipped cream. Shake slightly longer if whipped cream has not formed.
3. Close the container tightly.
4. Continue shaking until butter forms, approximately 10 minutes.
5. Pour off the liquid, "buttermilk."
6. Add salt to taste.
7. Spread butter on crackers. Enjoy!

Lesson 5: Food Processing and Safety

Objective: The student will be able to describe the importance of food processing and safety.

Study Questions

1. **What is food processing?**
2. **Why is food processed?**
3. **How are food products processed?**
4. **What are the steps in processing food from producer to consumer?**
5. **How do you know your food is safe?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.
2. Activity Sheets
   a) AS 5.1: Popcorn Processing (Instructor)
   b) AS 5.1: Popcorn Processing (Student)

Lesson 5: Food Processing and Safety

TEACHING PROCEDURES

A. Review

Foods of plant origin come from grains, vegetables, fruits, and other plants. Foods of animal origin come from beef, pork, poultry, sheep, fish, and seafood. Many consumers prefer to eat processed plant food products rather than the raw form. Most meat products are processed as well. This lesson will discuss reasons for food safety and techniques of food processing that help provide nutritious, quality foods for consumers.

B. Motivation (Select one.)

1. Bring a bag of potatoes to class along with a variety of products made from potatoes (e.g., chips, french fries, shoestring potatoes, and hash browns). Ask students to describe how each of the products was processed.

2. Bring in several different food items and draw a flow chart of the processes those food items go through from producer to consumer. Discuss these processes with the students.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is food processing?

A1. Processing includes all the steps which can be used to change a raw agricultural product into a consumable product.
- **a) Cleaning**
- **b) Drying**
- **c) Weighing**
- **d) Refrigerating**
- **e) Preserving**
- **f) Storing**
- **g) Changing the form**

Discuss processing. Processing can be a very simple or complicated process. Processing strawberries to be frozen whole is quite simple as compared to processing flour. Strawberries need to be washed, sorted, and de-stemmed before freezing. Wheat would need to be cleaned, dried, weighed, and graded for quality before it can be ground into flour. Depending on the type of flour, it may also need to be separated into bran and germ before being ground. Have students complete the popcorn activity (AS 4.1). [A separate teaching procedure page is included with this activity.] Note that processing also involves the methods and conditions of proper storage.

Q2. Why is food processed?

A2.
- **a) To improve taste**
- **b) To maintain quality**
- **c) To prevent spoilage**
- **d) To insure food is safe to eat**
- **e) For the convenience of consumers**

Food is an important part of everyday life. Foods must not only be nutritious but also safe from spoilage or contamination. Maintaining food quality is important for consumer acceptance. High quality foods generally command higher prices than would lower quality food products. Although quality and safety are important, the convenience of food to the consumer is also an important factor affecting how food is processed.

Q3. How are food products preserved?

A3.
- **a) Frozen**
- **b) Freeze-dried**
- **c) Canned**
- **d) Dried**
- **e) Vacuum-packed**
- **f) Smoking and curing**
- **g) Fermentation**
- **h) Irradiation**
- **i) Pasteurization**

Preservation is one of the steps in food processing. Discuss the different techniques used to preserve food. Bring in sample of foods that have been preserved used these techniques. Fermentation is used in processing coffee and cocoa beans into consumable products. Pasteurization kills bacteria normally found in milk to reduce disease problems.

Q4. What are the steps in processing food from producer to consumer?

A4.
- **a) Producer - grows plants or raises animals**
- **b) Harvester - removes the edible portions from plants in the field**
- **c) Processor - cleans, separates, handles, and prepares food for the distributor**
- **d) Distributor - stores foods until they are needed by wholesalers**
- **e) Wholesaler - sells fresh or processed foods to retailers**
- **f) Retailer - sells foods to consumers**
- **g) Consumer - eats fresh or processed foods**

Raw agricultural products can go through many steps before they reach the consumer. The more steps a product goes through the higher the marketing cost. If the consumer purchases the product straight from the producer, much of the marketing cost is reduced. For products like apples, purchasing from the producer may be very cost efficient. For other products like wheat, it would cost the consumer a lot of time to process the wheat into flour.

Q5. How do you know your food is safe?

A5. **Food quality is monitored by federal government agencies:**
- **a) Environmental Protection Agency (EPA)**

b) **Food and Drug Administration (FDA)**
c) **United States Department of Agriculture (USDA)**

Food safety is a major concern to consumers. Many steps are taken to ensure that food sold to consumers is safe to eat and is high quality. Several government agencies such as EPA, FDA, and the USDA regulate practices that affect the safety of the nation's food supply. Government inspectors are trained to identify potential problems before they reach consumers.

F. Other activities

1. **Have each student bring in a label from a food product. These can be read in class with a discussion about the different processing needs. Identify preservatives and additives that are used to maintain the quality of the food.**

2. **Bring in a food product or raw food ingredient and put it through selected processes to become the finished product. This product can be eaten in class when complete. Examples of foods and their products include: apples for applesauce, oranges for orange juice, chuck steak for hamburger.**

G. Conclusion

Work is continually being done to improve the processes by which food is prepared and preserved. Food safety and nutrition for the consumer continues to improve. U.S. government inspectors monitor the food processing industry to ensure safe food for consumers.

H. Competency

Describe the importance of food processing and safety.

Related Missouri Core Competencies and Key Skills:

7D-5: Follow multi-step directions in proper sequence.
8D-5: Follow multi-step directions in proper sequence.
8G-4: Follow a series of instructions in sequenced order.
8Q-5: **Identify and explain, with examples, why in the U.S. economy governments of various levels engage in some regulation of businesses; identify costs and benefits for individuals and businesses of various government regulations dealing with such matters as competition, health, safety, and fairness.**

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 5.1 - Popcorn Processing

The instructor will need to determine if answers are appropriate.

POPCORN PROCESSING

Materials:

popcorn (3/4 cup per group of 5 to 6 students)
water
oven
popcorn poppers (one per group)
vegetable oil (not needed if using air poppers)
paper towels or napkins
salt

Prior to conducting this activity the instructor will need to:

1. Divide popcorn into three equal-sized samples.
2. Place one sample of popcorn in water overnight.
3. Place a second sample of popcorn in an oven at 200°F for two hours.
4. Keep a third sample in a sealed plastic bag to maintain moisture content.

Teaching procedure:

1. Divide class into groups of five or six students.
2. Have students follow the procedures outlined on AS 5.1 (Student).
3. Lead a discussion. What happened? Did all three samples pop? Why not?

   The first two samples should not pop because the moisture level is not right. The third sample should pop because the moisture level was maintained around 13 percent. The moisture level must stay between 11.5 and 14.5 percent in order for the popcorn to pop. Have students sample the popped corn.

Lesson 5: Food Processing and Safety

Name ____________________

POPCORN PROCESSING

Objective: The student will be able to describe the importance of maintaining proper moisture level during the processing and storage of popcorn.

Materials:

1/4 c - Sample #1 - popcorn that has been soaked in water
1/4 c - Sample #2 - popcorn baked in the oven
1/4 c - Sample #3 - popcorn straight out of the bag
vegetable oil (if needed)
popcorn popper
3 bowls or containers for the popped corn
salt
paper towels or napkins

Procedure:

1. Place sample #1 in popper.
2. Turn popper on. Allow 10 minutes for popping; then, turn the popper off. Pour corn into bowl. CAUTION: Do not allow popcorn to pop too long. It will burn.
3. Record the results in the table below.
4. Repeat steps 1, 2, and 3 for sample #2.
5. Repeat steps 1, 2, and 3 for sample #3.
6. Add salt to the popped corn. Enjoy!

Popcorn	Did the sample pop?	Why or why not?
Sample #1		
Sample #2		
Sample #3		

How do processing and storage affect the quality of popcorn?

UNIT IV - PRODUCTS FROM AGRICULTURE

Lesson 6: Fiber Products from Agriculture

Objective: The student will be able to identify fibers produced from agriculture.

Study Questions

1. **What fiber products come from plants?**
2. **What fiber products come from animals?**
3. **What are synthetic fibers?**
4. **How do synthetic fibers differ from natural fibers?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.
2. Activity Sheet
    a) AS 6.1: Natural Fibers versus Synthetic Fibers

Lesson 6: Fiber Products from Agriculture

TEACHING PROCEDURES

A. Review

Cattle, hogs, sheep, poultry, and cotton are commonly produced for food. However, other products can also be obtained from plants and animals. Some plants and animals also provide fiber products. This lesson will discuss some of the fiber products from agriculture.

B. Motivation

Have students help each other find out what fibers make up their clothes. Examine tags on articles of clothing (coats, belts, shoes, hats, gloves, scarves, etc.) to determine what fibers and materials were used to make the clothes. Write the names of the fibers on the board and discuss their origins.

C. Assignment

D. Supervised study

E. Discussion

Q1. What fiber products come from plants?

A1.
a) Cotton
b) Linen - flax
c) Rope, burlap, and twine - hemp
d) Acetate and rayon - manufactured from cellulose from trees

Pass around samples of cotton, polyester, linen, rayon, acetate, rope, burlap, and twine. After students have had an opportunity to look at the samples, ask them to identify the samples and what they are made from.

Q2. What fiber products come from animals?

A2.
a) Wool - sheep
b) Mohair - Angora goats
c) Silk - silkworm
d) Paint brush fibers - animal hair
e) Violin strings
f) Feathers for pillows and quilts
g) Surgical sutures

Bring in an article of clothing made from wool and a sample of raw wool. Discuss where wool comes from. Note that many of the fibers from animals are by-products of animal production and processing.

Q3. What are synthetic fibers?

A3. **Synthetic fibers are made entirely from chemicals derived from raw materials such as coal, petroleum, and natural gas.**

a) **Acrylic**
b) **Nylon**
c) **Polyester**

Bring in some samples of polyester, nylon, and acrylic cloth. Describe how these fibers were developed when the raw materials were relatively inexpensive. As the price of the raw materials increases, so will the cost of these fibers.

Q4. How do synthetic fibers differ from natural fibers?

A4. a) **Natural fibers come from renewable resources.**
b) **Synthetic fibers come from nonrenewable resources.**

Discuss how synthetic fibers differ from natural fibers. Explain the difference between renewable and nonrenewable resources. Note that nonrenewable resources are limited in supply. Have students debate the use of natural fibers versus synthetic fibers. Have student complete AS 6.1.

F. Other activities

1. Have students develop a bulletin board or display to illustrate the variety of fiber materials produced in agriculture.
2. Bring in small samples of hemp rope and nylon rope. Have students evaluate the differences. Look at roughness, durability, etc.
3. Have a clothing and textiles expert compare cost, care, appearance, etc., of clothing made from natural fibers to clothing made from synthetic fibers.

G. Conclusion

Many fiber materials are processed from agricultural products. Cotton and wool are produced in the U.S. to help meet the demand for quality fabric. Cotton is grown in southern states. Wool is from sheep that are raised throughout the U.S. Many other fiber products are by-products of agricultural production. Fiber products produce from agricultural sources are renewable; whereas, synthetic fibers are produced from raw materials that are limited in supply.

H. Competency

Identify fibers produced from agriculture.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 6.1 - Natural Fibers versus Synthetic Fibers

The instructor will need to determine if answers are appropriate.

Lesson 6: Fiber Products from Agriculture

Name ____________________

NATURAL FIBERS VERSUS SYNTHETIC FIBERS

Objective: The student will be able to describe the advantages and disadvantages of using natural fibers and synthetic fibers.

In the space provided, describe the advantages and disadvantages of using natural fibers and synthetic fibers. Give reasons to support your position.

	Natural Fibers	Synthetic Fibers
Advantages		
Disadvantages		

Which type of fiber do you prefer? ____________________

Lesson 7: Nonfood Products from Agriculture

Objective: The student will be able to describe nonfood products from agriculture.

Study Questions

1. **What nonfood products are made from grains?**
2. **What nonfood products are made from trees?**
3. **What nonfood products are made from other plants?**
4. **What nonfood products are made from livestock?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit IV.
2. Activity Sheet
    a) AS 7.1: Nonfood Products from Hogs

Lesson 7: Nonfood Products from Agriculture

TEACHING PROCEDURES

A. Review

Many of the fibers in clothing come from agriculture. Cotton has remained one of the most common fabrics used for clothing. Wool is also popular for suits and sweaters. This lesson will discuss many of the other nonfood products from agriculture.

B. Motivation (Select one.)

1. Bring to class a leather basketball, baseball glove, shoe (or boot), and jacket. Ask students to identify what the articles have in common. Have students identify other products that could be made from leather.
2. To stimulate thinking about products from agriculture, have students work in groups of three or four to complete AS 7.1. Have students use their answers to discuss nonfood products from agriculture.

C. Assignment

D. Supervised study

E. Discussion

Q1. What nonfood products are made from grains?

A1.
a) Ethanol (grain alcohol)
b) Biodegradable plastics
c) Livestock feed
d) Soy-based inks

Ask students to discuss nonfood products processed from grains such as ethanol and biodegradable plastics. Describe how the use of these products helps reduce American dependence on petroleum-based products.

Q2. What nonfood products are made from trees?

A2.
a) Lumber
b) Paper
c) Cardboard
d) Christmas trees
e) Charcoal
f) Bark chips and mulch
g) Turpentine
h) Varnish
i) Paints

Ask students to name products from trees. List the answers on the chalkboard as they are discussed.

Q3. What nonfood products are made from other plants?

A3.
- a) **Trees, shrubs, ground covers, and grasses**
- b) **Flowers**
- c) **Insecticides**
- d) **Medicines - aloe vera**
- e) **Perfume**

Pass around a bottle of shampoo or hand lotion, containing aloe vera. Have students discuss the aloe and other plants that provide ingredients for nonfood products.

Q4. What nonfood products are made from livestock?

A4.
- a) **Detergents from animal fats**
- b) **Insulin from hogs**
- c) **Replacement heart valves for humans from hogs**
- d) **Feathers from chickens and ducks**
- e) **Leather from cattle and hogs**
  - 1) **Clothing**
  - 2) **Upholstery**
  - 3) **Book covers**
  - 4) **Luggage**
- f) **Soap**
- i) **Glue**
- j) **Candles**
- k) **Lanolin from wool**
- g) **Meal products from bones, feathers, blood, and fish**

Ask students why the agricultural industry wants to find new uses for animal parts. Why is it beneficial to be able to use feathers and leather? Describe the economic benefits of using the by-products of production or processing systems. Note that many of the nonfood products are made from materials which would be wasted or thrown away if alternative uses were not discovered.

F. Other activities

1. Have students write a paper about nonfood products from animals or plants.

2. Have students develop a chart with a cow, pig, chicken, soybeans, or corn in the center. Around the outside, provide examples of nonfood products that are derived from the raw material.

G. Conclusion

Many nonfood products are processed from agricultural products. Some plants or animals are raised specifically for the nonfood product such as aloe vera. Some nonfood products are by-products of animal or plant production and processing.

H. Competency

Describe nonfood products from agriculture.

Related Missouri Core Competencies and Key Skills: none

I. Answers to Unit Evaluation

1. F (Lesson 1)
2. T (Lesson 1)
3. T (Lesson 5)
4. F (Lesson 5)
5. T (Lesson 5)
6. T (Lesson 2)
7. T (Lesson 2)
8. F (Lesson 2)
9. b (Lesson 2)
10. d (Lesson 1)
11. a (Lesson 3)
12. c (Lesson 3)
13. d (Lesson 3)
14. b (Lesson 3)
15. b (Lesson 4)
16. c (Lesson 4)
17. a (Lesson 4)
18. b (Lesson 4)
19. d (Lesson 4)
20. d (Lesson 4)
21. c (Lesson 5)
22. a (Lesson 5)
23. d (Lesson 5)
24. c (Lesson 6)
25. a (Lesson 6)
26. b (Lesson 6)
27. a (Lesson 6)
28. d (Lesson 6)
29. b (Lesson 7)
30. c (Lesson 7)
31. The instructor will need to determine if examples given are appropriate for the following groups. (Lesson 2)
    a. Meat and meat alternatives
    b. Fruits and vegetables
    c. Grains
    d. Milk and milk products
32. The instructor will need to determine if the foods are in the correct plant group. Answers will vary with each student. (Lesson 2)
33. The instructor will need to determine if answers are appropriate. Answers may include lumber, paper, cardboard, Christmas trees, charcoal, bark chips, or mulch. (Lesson 7)

34. The instructor will need to determine if answers are appropriate. Answers may include detergents, insulin, heart valves, pillow feathers, clothing, upholstery, book covers, luggage, lanolin, bone meal, feather meal, blood meal, fishmeal, soap, glue, or candles. (Lesson 7)

J. Answers to AS 7.1 - Nonfood Products from Hogs

PART OF HOG	NONFOOD PRODUCT(S)
Bones	bone meal
Intestines	medical sutures, sausage casings
Hooves	piano keys, combs, imitation ivory
Skin	leather material, boots, gloves
Tail hair	paint brushes
Body fat (lard)	candles, crayons, soap, wax
Liver	medicines (blood anti-coagulant), vitamin B_{12}
Heart	heart valves (for human replacement)
Pancreas	insulin (for diabetes)
Pituitary gland	medicines

Lesson 7: Nonfood Products from Agriculture

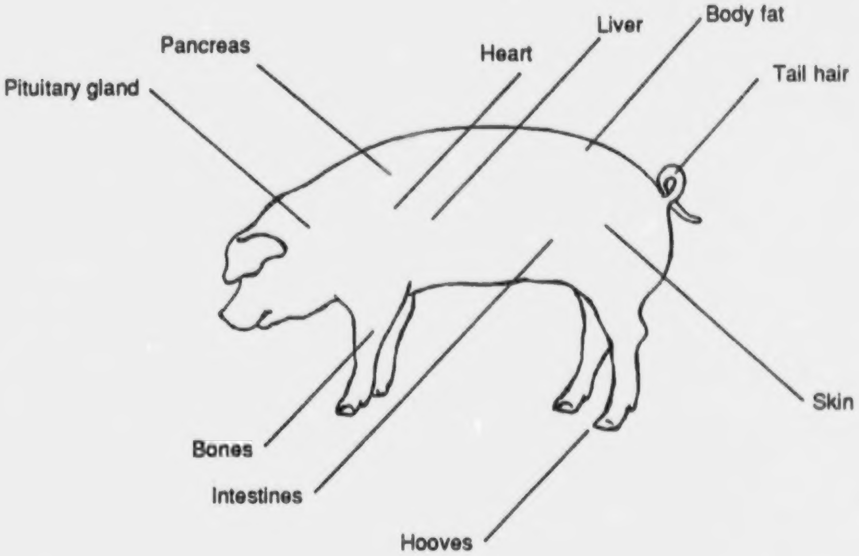
Name ________________

NONFOOD PRODUCTS FROM HOGS

Objective: The student will be able to identify nonfood products from hogs.

List one or more nonfood products from each of the parts of a hog identified below.

PART OF HOG	NONFOOD PRODUCT(S)
Bones	
Intestines	
Hooves	
Skin	
Tail hair	
Body fat (lard)	
Liver	
Heart	
Pancreas	
Pituitary gland	


Pancreas
Pituitary gland
Heart
Liver
Body fat
Tail hair
Skin
Bones
Intestines
Hooves

Name ____________________

Date ____________________

UNIT EVALUATION

True/False (Write the correct response in the blank provided.)

____ 1. Agriculture manipulates the environment to increase food production.

____ 2. People are part of a natural food chain.

____ 3. Picking and washing an apple can be considered processing.

____ 4. All food crops can be eaten in their raw form.

____ 5. Storage length can be lengthened by preserving techniques.

____ 6. Good health is dependent on a balanced diet.

____ 7. Grain products are high in carbohydrates.

____ 8. Fruits and vegetables are high in protein.

Circle the letter that corresponds to the best answer.

9. Which of the following food groups are high in vitamins?

   a. Meat and meat alternatives
   b. Fruits and vegetables
   c. Grains
   d. Milk and milk products

10. What is the primary goal of the agricultural food chain?

   a. To produce livestock for breeding
   b. To increase crop production
   c. To increase exportation of food crops to other countries
   d. To provide a constant food supply

11. Which of the following products are processed from grain?

   a. Flour, cereal, sweeteners
   b. Soups, cereal, sweeteners
   c. Pasta, snack chips, juices
   d. None of the above

12. How are fruits and vegetables processed?

   a. Fresh and oils
   b. Canned and cereals
   c. Frozen and fresh
   d. All of the above

13. Which of the following comes from plants?

    a. Chocolate and jams
    b. Syrup and nuts
    c. Pasta and cooking oils
    d. All of the above

14. White bread is usually made from what crop?

    a. Rice
    b. Wheat
    c. Barley
    d. Oats

15. A hot dog made from beef and pork is called ___________.

    a. Veal meat
    b. Combination meat
    c. Wholesale meat
    d. Synthetic meat

16. What is the term used for the meat from young cattle?

    a. Pork
    b. Beef
    c. Veal
    d. Poultry

17. Which of the following products are from dairy animals?

    a. Milk, ice cream, yogurt
    b. Veal, processed patties, lard
    c. Beef, pork, eggs
    d. None of the above

18. Which of the following products is not obtained from hogs?

    a. Pork chops
    b. Hamburger
    c. Ham
    d. Bacon

19. Which of the following is a freshwater fish?

    a. Shrimp
    b. Scallops
    c. Lobster
    d. Catfish

20. Which of the following is not obtained from beef animals?

a. Luncheon meat
b. Steak
c. Roast
d. Bacon

21. Who cleans, separates, handles, and prepares food for the distributor?

a. Harvester
b. Wholesaler
c. Processor
d. Producer

22. Which of the following describes the pasteurization process?

a. Heating a dairy product to kill bacteria
b. Cooling a dairy product to kill bacteria
c. Removing the moisture content to kill bacteria
d. Removing fat from a dairy product to kill bacteria

23. Which of the following is not a way of preserving foods?

a. Dehydration
b. Pasteurization
c. Irradiation
d. Homogenization

24. Which of the following fibers is manufactured from cellulose from tree fibers?

a. Cotton
b. Flax
c. Rayon
d. Mohair

25. Which of the following fibers can be used to make rope?

a. Hemp
b. Acetate
c. Flax
d. Angora

26. Which of the following fibers is produced by a worm?

a. Wool
b. Silk
c. Angora
d. Mohair

27. Which of the following is made from petroleum chemicals?

a. Polyester
b. Angora
c. Rayon
d. Acetate

28. Which of the following is a synthetic fiber?

a. Wool
b. Flax
c. Silk
d. Nylon

29. Which of the following is a nonfood grain product?

a. Charcoal
b. Ethanol
c. Aloe
d. Insulin

30. Which of the following products is made from trees?

a. Starch
b. Dextrose
c. Charcoal
d. Lanolin

Complete the following short answer questions.

31. Give two examples of foods in each of the four major food groups.

a. Meat and meat alternatives group: ____________________

b. Fruit and vegetable group: ____________________

c. Grain group: ____________________

d. Milk and milk products group: ____________________

32. Name four food products made from the following plant groups.

Vegetables

a. __________ b. __________ c. __________ d. __________

Fruits

a. __________ b. __________ c. __________ d. __________

Grains

a. __________ b. __________ c. __________ d. __________

33. Name three nonfood products from trees.

a.
b.
c.

34. Name four nonfood items made from animal products.

a.
b.
c.
e.

Lesson 1: Conservation of Natural Resources

Objective: The student will be able to describe the importance of conserving natural resources.

Study Questions

1. **What are natural resources?**
2. **What is the difference between renewable and nonrenewable resources?**
3. **Why should natural resources be conserved?**
4. **What agencies have the responsibility for protecting the U.S. environment?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit V.
2. Activity Sheets
   a) AS 1.1: Renewable vs. Nonrenewable Resources
   b) AS 1.2: Government Agencies

Lesson 1: Conservation of Natural Resources

TEACHING PROCEDURES

A. Introduction

Natural resources are important to the welfare of humans. Many of the products needed for survival rely on one or more natural resources. Conservation of precious natural resources is important for several reasons. This lesson will examine the importance of natural resource conservation.

B. Motivation (Select one.)

1. Natural resources are not limited to materials that produce energy (such as coal and oil). Air, water, soil, trees, and wildlife are also important natural resources. Acid rain, contaminated or polluted drinking water, clear cutting of forests, and wildlife poaching are conservation problems that need to be addressed. Identify and discuss natural resources that are important to society at this time.

2. Bring to class mounted specimens of fish or wildlife to initiate a discussion of hunting or fishing for recreation and population control.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are natural resources?

A1. **Natural resources are living or nonliving things that are commonly found in nature.**

Ask students to describe a natural resource. Write their answers on the chalkboard. Note that resources may include minerals, oil, trees, wildlife, fish, water, soil, air, and other materials found in nature. People have developed ways of using natural resources for their own benefit. People should avoid misusing or destroying natural resources; because, they may not be able to replace them.

Q2. What is the difference between renewable and nonrenewable resources?

A2. **a) A renewable resource is a natural resource that can be replaced.**
b) A nonrenewable resource exists in limited amounts.

Describe the difference between a renewable and a nonrenewable resource. If a nonrenewable resource is destroyed, it cannot be replaced. Have students complete AS 1.1. Ask students why they think it is important to know the difference.

Q3. Why should natural resources be conserved?

A3. **People depend on natural resources for food, shelter, energy, clothing, and enjoyment.**

Natural resources affect everyday life. Many resources are nonrenewable, once they are depleted, we will have no more to use. Renewable resources may be replenished, however the process may take a long time. For example, soil can be made, but erosion removes soil faster than it can be made.

Q4. What agencies have the responsibility for protecting the U.S. environment?

A4.
- a) **Bureau of Land Management**
- b) **Department of Fish and Wildlife**
- c) **National Park Service**
- d) **Environmental Protection Agency**
- e) **U.S. Forest Service**
- f) **Soil Conservation Service**
- g) **Agricultural Stabilization and Conservation Service**

Each agency has its own duties. There may be other agencies that have other responsibilities in protecting the environment and resources, but this discussion will concentrate on those listed above. Have students complete AS 1.2.

F. Other activities

1. Students could research a recycling program in their community. Start research at pick-up points and follow the product's path to the recycling center or the production of recycled products. Recycle the paper used in class for one week to calculate how much could be saved over a year's time.

2. Take the class on a field trip to a wastewater treatment plant.

3. Have students select one resource and provide information on the following.
    - a) Where is the resource geographically located?
    - b) What is the method used for retrieval for this resource? (mining, drilling, etc.)
    - c) What products are made from this resource?
    - d) What are the processing procedures of this resource?
    - e) How is it transported from area of retrieval to other parts of the region or world?
    - f) What are economic benefits to the country possessing this resource?

4. View the 25-minute video Guarding Our Living Environment available from the Missouri Vocational Resource Center.

5. Invite a forest service or conservation agent to speak to the class about the importance of conservation.

G. Conclusion

When conservation of natural resources is discussed, many people think of recycling aluminum cans and paper. Recycling is very important in the conservation of natural resources, but it is not the only conservation measure available. Other practices should be implemented that preserve the natural condition of the land, air, water, and wildlife resources. Preservation of these resources will ensure their availability for generations to come.

H. Competency

Describe the importance of conserving natural resources.

Related Missouri Core Competencies and Key Skills:

7B-1: Identify ways people have adapted to and affected their environment; identify issues related to people's use of the environment; and recommend ways of protecting the environment while meeting human needs.
8D-3: Analyze practices which best conserve wildlife and forests.
8K-2: Group examples of energy sources as renewable or non-renewable.
8B-1: Identify ways people have adapted to and affected their environment; identify issues related to people's use of the environment; and recommend ways of protecting the environment while meeting human needs.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

AS 1.1 - Renewable vs. Nonrenewable Resources

1. R
2. N
3. N
4. R
5. R
6. R
7. N
8. R
9. N
10. N
11. The instructor needs to determine if answers are appropriate.

AS 1.2 - Government Agencies

AGENCY	RESPONSIBILITIES
Bureau of Land Management	manages public lands; issues rights-of-way for crossing federal lands under other agencie's jurisdiction; surveys federal lands; and maintains public land and mining claim records
U.S. Forestry Service	*manages and cares for all of the nation's woodlots and national forests*
Department of Fish and Wildlife	manages and cares for wild birds, endangered species, certain marine mammals, and inland sport fisheries; develops environmental stewardship, promotes public education, and provides opportunities for the American public to appreciate natural resources
Soil Conservation Service	*provides technical expertise to the public in the area of soil conservation; works with soil and water conservation and concerned citizens*
National Parks Service	manages and administrates the properties under its jurisdiction for the enjoyment and education of U.S. citizens; protects the environment; assists states and local governments in the development of park areas; preserves and protects national monuments and historic sites
Agricultural Stabilization and Conservation Service	*provides funding and technical services to land owners for the construction of diversion terraces, ponds, and flood control structures; makes payments to farmers to keep them from producing row crops on land that could erode*
Environmental Protection Agency	*ensures environmental safety and protection by research and legislation; sets safety standards in air, water, land, chemicals, and many other areas that affect all life-forms*

Lesson 1: Conservation of Natural Resources Name ________________

RENEWABLE VS. NONRENEWABLE RESOURCES

Objective: The student will be able to identify renewable and nonrenewable resources.

To the left of each natural resource listed below, identify the renewable resources by writing an "R" in the blank and identify the nonrenewable resources by writing an "N" in the appropriate space.

1. ____ Oak trees
2. ____ Crude oil
3. ____ Natural gas
4. ____ Water
5. ____ Air
6. ____ Wildlife
7. ____ Coal
8. ____ Pine trees
9. ____ Iron ore
10. ____ Soil
11. What steps can you take to conserve resources in your community?

Lesson 1: Conservation of Natural Resources

Name ____________________

GOVERNMENT AGENCIES

Objective: The student will be able to identify responsibilities of selected agencies.

Fill in the blanks in table below.

AGENCY	RESPONSIBILITIES
	manages public lands; issues rights-of-way for crossing federal lands under other agencies' jurisdiction; surveys federal lands; and maintains public land and mining claim records
U.S. Forestry Service	
	manages and cares for wild birds, endangered species, certain marine mammals, and inland sport fisheries; develops environmental stewardship, promotes public education, and provides opportunities for the American public to appreciate natural resources
Soil Conservation Service	
	manages and administrates the properties under its jurisdiction for the enjoyment and education of U.S. citizens; protects the environment; assists states and local governments in the development of park areas; preserves and protects national monuments and historic sites
Agricultural Stabilization and Conservation Service	
Environmental Protection Agency	

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

Lesson 2: Soil Conservation

Objective: The student will be able to describe the causes and effects of soil erosion.

Study Questions

1. **What is soil?**
2. **What is soil erosion?**
3. **Why is soil erosion a problem?**
4. **Who is affected by soil erosion?**
5. **What is being done to combat soil erosion?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit V.
2. Activity Sheet
    a) AS 2.1: Examining Soils

Lesson 2: Soil Conservation

TEACHING PROCEDURES

A. Review

Natural resources are a precious commodity in the environment. Soil is one of the most precious natural resources. The importance of soil should not be underestimated, because soil can be considered the basis of all life. Therefore, it is important to conserve soil resources. Soil is a vital resource for the continued production of food and fiber crops. Each growing season, crops are planted and then harvested. Crops are considered renewable resources. However, the soil that supports plant growth, may be considered a nonrenewable resource.

B. Motivation (Select one.)

1. Using different samples of soil, explain how plants get what they need from the soil. Pass different types of soil samples around for students to see and feel.
2. Ask students how many of them cross a creek to get to school. When a heavy rain comes, what color is the creek? Point out that the muddy color is actually soil in the water. Discuss how long it takes to replace one inch of top soil (It takes between 200 and 1,000 years.).
3. Take students on a walk of the school grounds. Identify erosion problem areas or potential areas. Discuss what could be done to control erosion in these areas.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is soil?

A1. Soil is a naturally occurring mixture of minerals, organic matter, water, and air that supports plant growth.

Soil supports plant growth by providing nutrients and water. Air is also important for plant growth and may be absorbed through root hairs in the soil. Divide the class into four or five groups to complete AS 2.1. Have each group collect soil from a different area.

Q2. What is soil erosion?

A2. Soil erosion is the movement of soil from one place to another by wind or water.

Soil erosion is a local, national, and international problem. Several tons of top soil are lost each year due to wind or water erosion. Land on steep slopes is more subject to erosion than flat land. Missouri has a serious problem with soil erosion as a result of its rolling terrain.

Q3. Why is soil erosion a problem?

A3. Soil erosion removes nutrients needed for plant growth and leaves less fertile subsoil behind. Erosion caused by water runoff also fills lakes, rivers, and streams with soil.

There are other negative effects of soil erosion. As soil erosion occurs, it carries away small soil particles, leaving behind the larger particles. The loss of smaller minerals, organic particles, and nutrients leads to a lowered fertility in the soil. Soil deposits in bodies of water are harmful to fish and other water creatures. The shape of some rivers has been permanently changed (shallower, but wider) as a result of soil deposits settling in the main channel.

Q4. Who is affected by soil erosion?

A4. Everyone is affected by soil erosion.

Soil erosion is a local, national, and international problem. An estimated 6.4 billion tons of soil erode in the U.S. alone each year. Farmers must use more commercial fertilizers to compensate for the less fertile soil that remains after erosion. Over time food costs will be expected to rise due to the higher costs of production. The natural environment is also damaged, which ultimately impacts everyone.

Q5. What is being done to combat soil erosion?

A5. Farmers, universities, and industries are working together to conserve the soil.

Farmers are using crop production practices that will reduce the amount of soil erosion. Soil erosion cannot be eliminated, but it can be reduced. Government agencies and researchers are also developing programs to help reduce soil erosion in this and other countries.

F. Other activities

1. Gather pictures of areas that have been affected by soil erosion. Discuss the adverse effects.
2. On the chalkboard, list measures or techniques that can be used to prevent soil erosion.
3. View the video Stream Sense available through the Missouri Vocational Resource Center.
4. Invite a representative of the Soil Conservation Service to discuss soil conservation.

G. Conclusion

Soil is a precious resource needed to sustain life. Most soil erosion is caused by the movement of wind or water across the soil surface. Soil erosion removes fertile topsoil leaving less fertile subsoil behind. Soil erosion is a problem that affects everyone. Farmers and others are using soil management practices to conserve soil resources.

H. Competency

Describe the causes and effects of soil erosion.

Related Missouri Core Competencies and Key Skills:

7C-3: Identify and explain cause-effect relationships.
8C-3: Identify and explain cause-effect relationships.
8D-4: Predict the effects of pollution (e.g., acid rain, smog, oil spills, excess pesticides, and fertilizer run-off) on the environment.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers for AS 2.1 - Examining Soils

The instructor needs to determine if students have completed this activity appropriately.

Lesson 2: Soil Conservation

Name ________________

EXAMINING SOILS

Objective: The student will be able to describe characteristics of a soil sample.

Materials:

Spade
Soil augur or soil sampling probe
Newspaper or plastic sheet
Plastic pail

Procedure:

1. Identify an area in the school yard or nature area. (Check with the teacher before digging.)
2. Without removing any surface material, dig up a core of soil 3 inches in diameter to a depth of 6 to 8 inches.
3. Carefully place the soil core in the plastic bucket and return to the classroom.
4. Spread a newspaper or plastic sheet over a table.
5. Carefully move the soil core onto the covered table.
6. Answer the following questions about the soil sample.
    a) What kinds of debris or plants were on the soil surface?
    b) What color was the soil near the surface?
    c) What color was the soil near the bottom?
    d) Were there rocks or other materials buried in the soil?
    e) Describe the texture of the soil when you run it between your fingers. Was it grainy or smooth?
    f) How does your soil sample differ from the samples collected by other groups?

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

Lesson 3: Water Quality and Conservation

Objective: The student will be able to describe methods of conserving water.

Study Questions

1. **In what ways is water used in the U.S.?**
2. **How is water purified naturally?**
3. **What are sources of water pollution?**
4. **What is being done to protect and purify water resources?**
5. **What are some methods of water conservation?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit V.
2. Transparency Master
    a) TM 3.1: The Water Cycle
3. Activity Sheet
    a) AS 3.1: How Much is a Drip?

Lesson 3: Water Quality and Conservation

TEACHING PROCEDURES

A. Review

In the previous lesson, the importance of soil and soil conservation were discussed. Another important natural resource is water. Water is needed for human consumption, to produce food and to aid in the production of virtually all manufactured products. This lesson explains the water cycle, causes of water pollution, what is being done to protect water resources, and ways in which water can be conserved. All life depends on water, so it is important that individuals take care of this valuable resource.

B. Motivation (Select one.)

1. To illustrate how pollutants enter the water cycle, demonstrate the following exercise. Using a dropper, drop dark food coloring on a slice of white bread (fresh or stale) while held vertically. Mist the bread with water. Watch how the food coloring seeps through the bread. Compare the food coloring to a pollutant, the bread to soil, and the water to rain. Notice how the food coloring is dispersed throughout the bread as water is applied to it.

2. Using a Bunsen burner, boil a small amount of water to produce steam. Ask students what has happened to the water.

3. Chart out on the chalkboard where your city's or community's water supply comes from.

4. Show the video Missouri Groundwater: The Hidden Resource available from the Missouri Vocational Resource Center.

C. Assignment

D. Supervised study

E. Discussion

Q1. In what ways is water used in the U.S.?

A1.
a) Human consumption (drinking, cooking, bathing, etc.)
b) Crop irrigation
c) Animal consumption
d) Transportation (boats, barges, etc.)
e) Industry
f) Recreation (boating, swimming, fishing, etc.)
g) Power generation

There are many uses for water in the U.S. Each of the uses requires water that is clean and free of impurities. Water that is polluted must be purified either naturally or through some manmade process. Removing impurities from water is expensive and time consuming. People should be careful to avoid polluting water resources.

Q2. How is water purified naturally?

A2. **Water is purified as it goes through the hydrologic (water) cycle.**

Ask students how water is purified. Discuss the hydrologic cycle. Bring to class an enclosed terrarium and describe the processes of water evaporation and condensation. Relate these processes to the hydrologic cycle that occurs in nature.

Q3. What are some sources of water pollution?

A3.
- a) **Municipal wastewater**
  - 1) **Household waste**
  - 2) **Industrial sources**
- b) **Nonpoint pollution**
  - 1) **Soil erosion (topsoil, pesticides, animal waste, fertilizers)**
  - 2) **Mining waste**
  - 3) **Timber harvesting**
  - 4) **Construction sites**
- c) **Sanitary landfills**
- d) **Wastewater treatment facilities**
- e) **Underground storage tanks**
- f) **Chemical container disposal**
- g) **Toxic waste disposal**

Discuss sources of water pollution. Note that there are water sources above ground including lakes, rivers, and streams. In addition, there are many below-ground water storage reservoirs called aquifer. Pollution of water resources, either above or below ground is a serious problem throughout the world.

Q4. What is being done to protect and purify water resources?

A4. **Laws have been enacted to protect water sources.**

There are many ways in which pollutants can enter into water resources. Discuss what is being done to protect water quality. The U.S. government is placing many restrictions on activities that could contribute to water pollution. The Environmental Protection Agency (EPA) and several other federal agencies monitor pollutants in U.S. water resources.

Q5. What are some methods of water conservation?

A5.
- a) **Use water conserving plumbing fixtures at home.**
- b) **Avoid careless use of water at home. (shorter showers, less lawn irrigation, etc.)**
- c) **Recycle industrial wastewater.**
- d) **Grow crops that require less irrigation water.**

In order for water conservation to work, the public needs to be educated about ways to conserve water. Discuss methods of saving water. Have students calculate (use AS 3.1) the amount of water wasted from a leaky faucet that drips once every two seconds. (3 drips equals about 1 cc. water.)

F. Other activities

1. Have students take a water sample. The instructor should have the results of an earlier test ready to discuss with the students.
2. Have students clip articles from local newspapers that deal with water pollution topics. Post the articles on the bulletin board.
3. Show the video The Groundwater on the Move available from the Missouri Vocational Resource Center.
4. Show the film Keeping Groundwater Clean from Deere and Company.
5. Tour a local water treatment plant.

G. Conclusion

Water is a precious resource. Although water may be considered a renewable resource, it can be contaminated to the point that it is virtually unusable. Each individual can take part in protecting water supplies. An awareness of the causes of pollution is vital in maintaining quality water resources.

H. Competency

Describe methods of conserving water.

Related Missouri Core Competencies and Key Skills:

7C-5: Draw and explain cycles such as the water cycle, carbon cycle, and oxygen cycle.
7G-3: Describe the water cycle.
8D-4: Predict the effects of pollution (e.g., acid rain, smog, oil spills, excess pesticides, and fertilizer run-off) on the environment.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 3.1 - How Much is a Drip?

1. 30
2. 30; 1,800
3. 1,800; 43,200
4. 43,200; 15,768,000
5. 15,768,000; 5,256,000
6. 5,256,000; 5,256
7. 5,256; 4,974
8. 4,974; 1,243.5
9. 1,243.5
10. You should fix the faucet.

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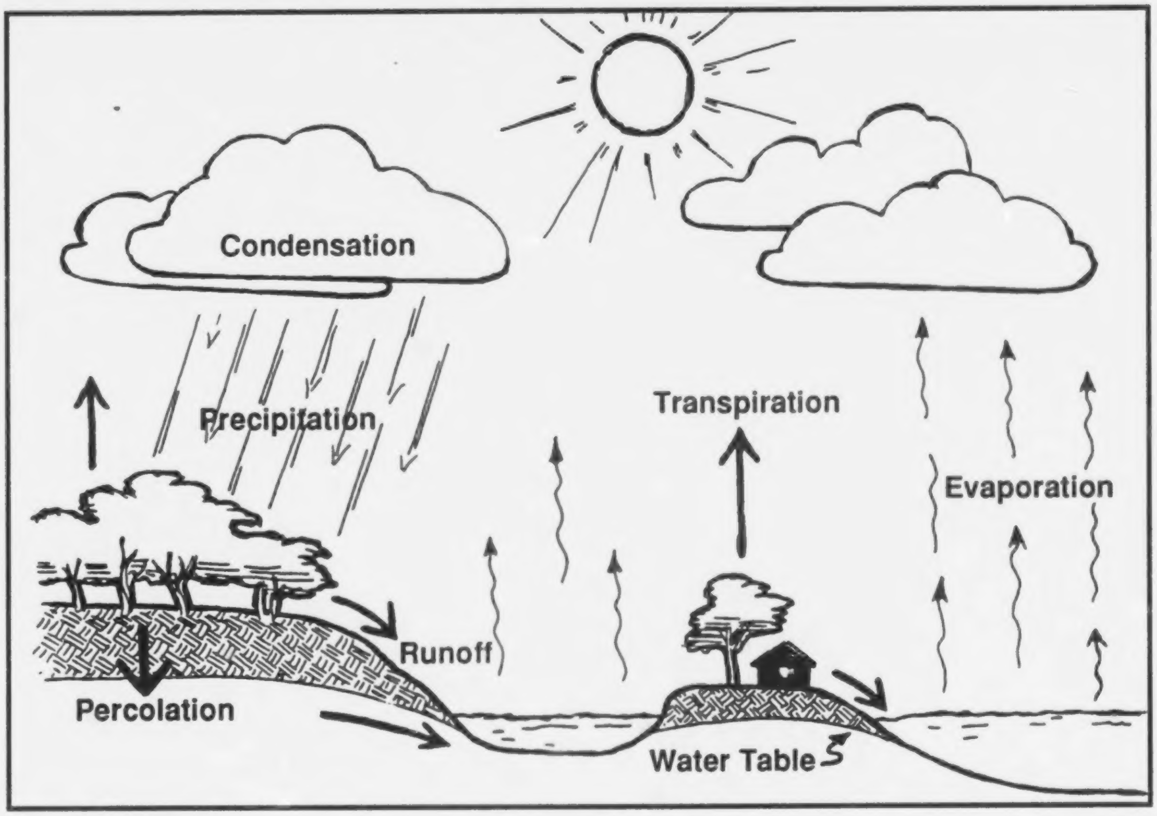
The Water Cycle


Condensation
Precipitation
Transpiration
Evaporation
Runoff
Percolation
Water Table

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION AS 3.1

Lesson 3: Water Quality and Conservation Name __________________

HOW MUCH IS A DRIP?

Objective: The student will be able to calculate the amount of water wasted from a leaky faucet.

Suppose you have a leaky faucet in your home that drips a drop of water every two seconds. Can you guess how much water the leaky faucet would waste in a year? Complete the formulas provided below to calculate how many gallons of water are wasted from a leaky faucet.

1. 1 drip every 2 seconds = _____ drips per minute
2. __________ drips per minute x 60 minutes/hour = __________ drips per hour
3. __________ drips per hour x 24 hours/day = __________ drips per day
4. __________ drips per day x 365 days/year = __________ drips per year
5. __________ drips per year ÷ 3 drips/milliliter = __________ milliliters per year
6. __________ milliliters ÷ 1,000 milliliters/liter = __________ liters per year
7. __________ liters ÷ 1.0567 liters/quart = __________ quarts per year
8. __________ quarts ÷ 4 quarts/gallon = __________ gallons of water in one year
9. Conclusion: The leaky faucet would waste __________ gallons of water in one year.
10. Should you fix a leaky faucet or let it drip for another year?

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

Lesson 4: Air Pollution

Objective: The student will be able to describe ways to reduce air pollution in the U.S.

Study Questions

1. **What is air pollution?**
2. **What are sources of air pollution?**
3. **What are the different types of air pollutants?**
4. **What steps have been taken to control air pollution?**

Reference

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit V.

TEACHING PROCEDURES

A. Review

Lesson 3 discussed water quality and conservation. This lesson will discuss air pollution. Many people don't think about the effect of air quality on their health. Fresh, clean air is necessary for life but frequently is taken for granted. Citizens should strive to keep air clean by recognizing and avoiding causes of air pollution. In this lesson, air pollution's causes and clean-up will be discussed.

B. Motivation (Select one.)

1. Using an oxy-acetylene torch, light the torch with only acetylene to show the soot that is formed. Ask students what happens to the soot in the air.
2. Using a white paper towel, hold it over the exhaust pipe of a car that is running. Repeat the experiment on a diesel car or truck. Were there any differences in the color of the exhaust emissions?
3. Bring to the class an air filter from a furnace to show students how much dust, etc., is contained in the air people breathe.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is air pollution?

A1. Air pollution is the contamination of air with particles or gases that are harmful to the environment.

Air pollution includes any particles or gases which are present in the air that are harmful to the environment. Some gases may be quite toxic while others may cause offensive odors. Air pollutants may also reduce the oxygen content of the air which can make breathing difficult. Solid particles suspended in the air may also be filtered out in the lungs which may create several different health problems. Air pollution affects human, animal, and plant life.

Q2. What are sources of air pollution?

A2. a) Mobile sources - trucks, buses, cars, boats, gasoline-powered tools, trains, etc.
b) Stationary sources - electric utilities; factories; buildings that burn coal, oil, wood, natural gas, and other fuels; etc.
c) Confinement livestock units
d) Waste handling facilities

Air pollution can be caused by many sources. Burning is one of the greatest sources of air pollution. Smoke and exhaust from cars, power plants, and manufacturing plants produce a variety of air pollutants. Sometimes air pollution is so great that people can see the problem (e.g., smog, smoke). At other times, air pollution can be caused by colorless gases, which are invisible.

Q3. What are the different types of air pollutants?

A3. a) **Gaseous pollutants (carbon monoxide, nitrogen dioxides, sulfur dioxides, and hydrocarbons)**
b) **Odor**
c) **Particulate matter (smoke, soot, dust, etc.)**

Gaseous pollutants are produced from the burning of fossil fuels such as coal, oil, or natural gas. (Note the problem caused by the burning oil fields in Kuwait in 1991 following the Gulf War.) Cigar, cigarette, and pipe smoking indoors, in an enclosed environment also pollutes the air breathed by everyone in the room. Odor pollution is frequently created by confinement livestock production. Particulate matter, usually soot or dust, is usually produced from manufacturing plants or other "heavy industry."

Q4. What steps have been taken to control air pollution?

A4. a) **Clean Air Act passed in 1970**
b) **Motor vehicle emission controls on new cars**
c) **Motor vehicle exhaust inspection**
d) **Increased public transportation system to decrease the use of private automobiles**
e) **Use of lead-free gasoline**
f) **Non-smoking public areas**
g) **Educate the public**

Although progress has been made in controlling air pollution, more needs to be done. The public has become more conscious of the environment and is taking steps to maintain air quality. Each person should do his or her part to reduce air pollution and to maintain a healthy environment in which to live.

F. Other activities

1. Have students clip out newspaper articles and write short critiques or summaries of these articles for credit.

2. Divide the class into two groups. Have students debate whether smoking should be allowed in public buildings.

3. Assign students to make a collage of magazine and newspaper pictures of air pollution sources.

4. Ask students to identify one source of air pollution and present to the class a way the source can be prevented or reduced.

5. Have students draw a schematic diagram illustrating how "acid rain" combines problems of air and water pollution.

6. Ask students to research the problems associated with burning coal with a high sulfur content.

G. Conclusion

Air pollution contributes to health problems in humans, animals, and plants. There are several sources that contribute to air pollution problems. Each person has a responsibility to work towards solving and preventing air pollution. Clean air is important for a healthy environment.

H. Competency

Describe ways to reduce air pollution in the U.S.

Related Missouri Core Competencies and Key Skills:

8D-4: Predict the effects of pollution (e.g., acid rain, smog, oil spills, excess pesticides, and fertilizer run-off) on the environment.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION

Lesson 5: Wildlife Conservation

Objective: The student will be able to describe the role of wildlife in the U.S.

Study Questions

1. **How was wildlife viewed in the early history of North America?**
2. **How has the role of wildlife changed?**
3. **What causes wildlife to become endangered?**
4. **How does our society protect wildlife resources?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit V.
2. Activity Sheet
   a) AS 5.1: Defining Ethics (Instructor)

Lesson 5: Wildlife Conservation

TEACHING PROCEDURES

A. Review

In the previous lesson, air pollution was discussed and what needs to be done to control it. This lesson will discuss wildlife conservation. Wildlife includes all animals that live in the natural environment without human help. Domestic animals require humans to survive and probably would not thrive in nature. Wildlife have been used for various purposes by humans throughout history.

B. Motivation (Select one.)

1. Ask students if they know of anyone who has tried to tame a wild animal and keep it for a pet. Have them describe their experiences.
2. Have a Department of Conservation agent speak to the class about the goals of wildlife management.
3. Ask students if they can name any endangered wildlife in their state. Also, ask students if they know what is being done in their state to protect these wildlife species.

C. Assignment

D. Supervised study

E. Discussion

Q1. **How was wildlife viewed in the early history of North America?**

A1. **Wildlife were a source of food and clothing needed for survival.**

Colonial and native Americans were dependent on wildlife for meat, leather, and other products needed for survival. The vast quantities of wildlife seemed almost endless to the early settlers. However, with the westward expansion, much of the wildlife habitat has been destroyed.

Q2. **How has the role of wildlife changed?**

A2. **Wildlife are used today for sport fishing, hunting and aesthetic enjoyment.**

Most wildlife are no longer required for food and clothing. Wildlife are used in the following ways: sport fishing, hunting, bird-watching, wildlife photography, and viewing animals in zoos and parks.

Q3. **What causes wildlife to become endangered?**

A3. **a) Loss of habitat**
b) Over-hunting

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d) Natural diseases and pests
c) Pollution

Some species of animals have become so few in number that they may become extinct. Once a species become extinct, it is gone forever. Several factors have caused the number of wildlife in this country to decrease. However, people are the greatest culprit. Destruction of natural habitat, over hunting, and pollution in the environment are the greatest problems.

Q4. How does our society protect wildlife resources?

A4. Conservation laws and management techniques are used to protect wildlife.

For many countries, wildlife and the awareness of wildlife are part of their cultures. In the U.S., a wide range of opportunities are provided for individuals to experience wildlife. Laws have been established for managing wildlife resources, particularly for the protection of endangered species by controlling hunting and fishing. Conservation efforts are important to protect wildlife species and to maintain the balance of nature. Funds generated from the sale of hunting and fishing licenses are used to support wildlife conservation activities. Activity 5.1 is an instructor - directed activity. The instructor should read the first part out loud to the class. Then, follow the teaching procedure section to complete the activity.

F. Other activities

1. Assign students to make posters on different types of wildlife by collecting pictures from magazines.

2. Ask students to clip newspaper articles on wildlife preservation or current events dealing with wildlife.

3. Have a panel debate on the pros and cons of regulating hunting and fishing.

4. View one of the following videos available through the Missouri Vocational Resource Center.

   a) Guarding Our Living Environment
   b) Time Shadows: Encounters with the Whitetail
   c) Dedicated to Conservation II

5. Take a field trip to a wildlife area.

G. Conclusion

Many factors play an important role in wildlife populations. Wildlife management is an important part of wildlife protection. People must recognize and take responsibility for their own actions to protect wildlife resources.

H. Competency

Describe the role of wildlife in the U.S.

Related Missouri Core Competencies and Key Skills:

8D-3: Analyze practices which best conserve wildlife and forests.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 5.1 - Defining Ethics

There are no right or wrong answers for this activity.

DEFINING ETHICS

Objective: The student will participate in a discussion concerning ethics in wildlife conservation.

Read the following out loud to the class.

Jane, Ben, Harold, and Cathy live in the same county. They all grew up together and went to the local high school. As high school students they learned to hunt, and since becoming adults, they have continued the sport. How and why they hunt differ, however.

Jane has five children and has had trouble finding a steady job. She admits that she sometimes takes game out of season or more than her limit, but she needs the food for her family. Times are rough, she says, and she has to feed her family however she can.

Ben was very competitive in school and prides himself in always doing better than anyone else. He loves to hunt, but he always wants the biggest and the most. He frequently brags that he always takes his limit. What he doesn't need he leaves in the field, throws away, gives to friends, or sometimes sells.

Harold lives in an expensive home and drives an expensive car. He has many debts. Although he has a good job, he is always looking for a way to make extra money. What he shoots he usually sells. Harold doesn't pay much attention to legal seasons. His philosophy is just not to get caught.

Cathy owns a farm in the country. She has had continual problems with deer eating her corn. She has contacted the Conservation Department and received suggestions of what to do, but she still feels that deer are overabundant and are pests that need to be destroyed. She spotlights deer whenever she can, shoots them, and throws them into a ditch. She says every deer she kills is one less deer to eat her valuable crops.

Teaching Procedure:

Divide the class into groups of five or six. Though the actions of all individuals are illegal, have the groups discuss whether their behavior is ethical or unethical. Have each group rank the people's behavior. Allow 10 minutes.

Call time after 10 minutes. Write the individual's names on the blackboard or a large sheet of paper. Ask each group to tell how the characters ranked and list the rankings after each name. Did the groups agree on whether or not the men acted ethically or unethically? Did their rankings agree or disagree? Did any character rank consistently the same? Have the groups defend their choices. Point out that frequently with ethical decisions there is no right or wrong answer. Ethical judgments are based on values, and individuals have different value systems. Therefore, there may be no right or wrong answer to this activity.

Credit: S.P.O.R.T. Ethics Class. Missouri Department of Conservation, 1985.

Lesson 6: Outdoor Recreation

Objective: The student will be able to describe opportunities in outdoor recreation.

Study Questions

1. **What is outdoor recreation?**
2. **What are some outdoor recreational activities?**
3. **What is the purpose of the national park system?**
4. **What careers are available in outdoor recreation?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit V.
2. Activity Sheet
    - a) AS 6.1: Planning a Vacation

Lesson 6: Outdoor Recreation

TEACHING PROCEDURES

A. Review

The previous lesson discussed wildlife conservation. This lesson will discuss outdoor recreation. Outdoor recreational activities are becoming more important as people have more leisure time. Such activities may range from a quiet walk along a nature trail to a fishing or hunting trip. Many people enjoy the feeling of spending time in isolated places, close to nature, and breathing fresh, clean air. This lesson will examine opportunities for outdoor recreational activities.

B. Motivation (Select one.)

1. Ask students to describe what they did on their favorite vacations.
2. Ask students to identify their favorite outdoor recreational activities.
3. Ask students to describe what they would do on the ideal vacation in one of the national parks.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is outdoor recreation?

A1. Recreational activities that are conducted in the natural environment

Increased leisure time in society provides more time for recreation. Many people prefer to spend their leisure time in activities outdoors and close to nature. Outdoor recreational opportunities are dependant upon conservation efforts to maintain the natural environment for everyone to enjoy, including future generations.

Q2. What are some outdoor recreational activities?

A2.
a) Camping
b) Hunting
c) Boating
d) Canoeing
e) Fishing
f) Trapping
g) Swimming
h) Picnicking
i) Horseback riding
j) Hiking
k) Bicycling
l) Bird-watching

m) **Photography**
n) **Golfing**

Outdoor recreational activities are numerous and varied. Some activities may require access to special equipment such as a boat, a gun, or camping gear. Other activities such as hiking or picnicking require little or no special equipment. Opportunities for involvement in outdoor recreational activities vary from one area to another. State and national parks often restrict hunting and fishing in those areas.

Q3. **What is the purpose of the national park system?**

A3. **To preserve nature areas, historic sites, and recreational areas**

Nature areas such as wildlife sanctuaries and forests have been set aside to preserve natural environments which have not been disturbed by humans. Historic sites include monuments, cemeteries, battlefields, and memorials to preserve and honor certain activities, events, or persons of historical significance. Recreational areas include seashores, lakes, river ways, and parks to provide outdoor recreational opportunities. Have students complete AS 6.1.

Q4. **What careers are available in outdoor recreation?**

A4.
a) **Park ranger**
b) **Park aides and technicians**
c) **Park guides and guards**
d) **Fish and service guides**
e) **Recreationists**
f) **Private business**
g) **Conservation officer**
h) **Wildlife biologist**

There are a number of different career opportunities related to outdoor recreation. Some of the careers require little or no formal education beyond high school (e.g., park aids) while some will require education of the master's degree level or above (e.g., wildlife biologist). Each of the careers has significant involvement with outdoor activities.

F. Other activities

1. Have a member of the community speak to the class on a national park they have visited.

2. Have a taxidermist bring mounted fish or game to class to describe their work.

3. Have students develop a list of materials and equipment they would need for a weekend camping trip.

G. Conclusion

Many people enjoy spending leisure time on outdoor recreational activities. There are many types of outdoor recreation and many areas to enjoy. Numerous career opportunities are available in outdoor recreation.

H. Competency

Describe opportunities in outdoor recreation.

Related Missouri Core Competencies and Key Skills:

7D-2: Use graphic sources for information: pictures, maps, graphs, time lines, charts diagrams, tables, and schedules, etc.
7E-1: Interpret and use such materials as routes, schedules, timetables, and signs.
7A-1: Communicate locations of places and routes that may be taken to get from one location to another.
8D-2: Use graphic sources for information: pictures, maps, graphs, time lines, charts diagrams, tables, and schedules, etc.
8E-1: Interpret and use transportation/communication materials such as: routes, schedules, timetables, signs, marquees, billboards, and travel brochures.
8A-1: Communicate locations of places and routes that may be taken to get from one location to another.

I. Answers to Unit Evaluation

1.	T	(Lesson 1)	11.	a	(Lesson 1)
2.	T	(Lesson 2)	12.	c	(Lesson 1)
3.	F	(Lesson 2)	13.	d	(Lesson 2)
4.	F	(Lesson 3)	14.	d	(Lesson 3)
5.	F	(Lesson 4)	15.	a	(Lesson 3)
6.	T	(Lesson 4)	16.	b	(Lesson 4)
7.	T	(Lesson 5)	17.	d	(Lesson 4)
8.	F	(Lesson 6)	18.	c	(Lesson 5)
9.	T	(Lesson 6)	19.	d	(Lesson 5)
10.	c	(Lesson 1)	20.	b	(Lesson 6)

21. A natural resource is a living or nonliving thing that is commonly found in nature. (Lesson 1)

22. Soil is a naturally occurring mixture of minerals, organic matter, water, and air that supports plant growth. (Lesson 2)

23. Answers may include three of the following: use water-conserving plumbing fixtures, take shorter showers, water the lawn less, wash the car less, plant flowers and other plants that require less irrigation (Lesson 3)

24. Pollution can make wildlife sick or kill them. (Lesson 5)

25. Answers may include three of the following: park ranger, park aides and technicians, park guides and guards, fish or service guides, recreationists, private business, conservation officer, wildlife biologist (Lesson 6)

J. Answers to AS 6.1 - Planning a Vacation

Answers will vary.

Lesson 6: Outdoor Recreation Name ________________

PLANNING A VACATION

Objective: The student will be able to plan a vacation to a state or national park.

Plan a vacation to a state or national park. Answer the following questions while finding information about the park that you would like to spend your vacation.

How far is the park from your home?

What is the best route to follow to get to the park?

When is the park open? (time of year and daily hours)

What types of recreational opportunities are available in the park?

What types of facilities (e.g., rest rooms, trailer hook-ups, campgrounds, and lodges) are available?

How much does it cost to spend the day? night?

Are there any special regulations that you should follow? If so, what are they? For example, "No bicycles are allowed on the hikers path."

UNIT V - ENVIRONMENT AND RESOURCE CONSERVATION Name ____________

Lesson 6: Outdoor Recreation Date ____________

UNIT EVALUATION

True or False (Place the correct response in the blank provided.)

____ 1. People depend on natural resources for food, shelter, energy, clothing, and enjoyment.

____ 2. Soil erosion is the movement of soil from one place to another by wind or water.

____ 3. Only farmers are affected by soil erosion.

____ 4. Water is only used for power generation, human consumption, and crop irrigation.

____ 5. Odor is not considered a type of air pollution.

____ 6. Air pollution is the contamination of air with particles or gases that are harmful to the environment.

____ 7. Animals that are close to extinction are classified as an "endangered species."

____ 8. The only purpose of the national park system is to preserve nature areas.

____ 9. Outdoor recreation is all the recreational activities that are conducted in the natural environment.

Circle the letter that corresponds to the best answer.

10. Which of the following is a renewable resource?

    a. Mineral
    b. Oil
    c. Water
    d. Coal

11. Which agency preserves and protects national monuments?

    a. National Parks Service
    b. Bureau of Land Management
    c. Department of Fish and Wildlife
    d. U.S. Forestry Service

12. Which agency manages and cares for wild birds and endangered species?

    a. National Parks Service
    b. Environmental Protection Agency
    c. Department of Fish and Wildlife
    d. U.S. Forestry Service

13. What is a problem caused by soil erosion?

    a. Coarser, less fertile soil is washed away
    b. Only the silt particles remain after erosion
    c. Topsoil depth is increased by erosion
    d. Sediment deposited in lakes and rivers creates problems

14. How is water purified naturally?

    a. Condensation
    b. Evaporation
    c. Rain cycle
    d. Hydrologic cycle

15. Soil erosion and mining waste are two types of what kind of pollution?

    a. Nonpoint pollution
    b. Air pollution
    c. Ground pollution
    d. Environmental pollution

16. Which of the following is a mobile source of air pollution?

    a. Electric utilities
    b. Gasoline-powered tools
    c. Factories
    d. Buildings

17. What did the Clean Air Act of 1970 provide legislation and support for?

    a. Controlling industrial pollution
    b. Reducing the use of unleaded gasoline
    c. Setting car manufacturing standards
    d. Setting clean air standards

18. What is the main cause for the reduction of wildlife?

    a. Pollution
    b. Over-hunting
    c. Loss of habitat
    d. Natural pests and diseases

19. What was the early role of wildlife?

    a. Bird-watching
    b. Sport fishing and hunting
    c. Food and shelter
    d. Food and clothing

20. Which of the following is not considered a type of outdoor recreation?

a. Riding
b. Reading
c. Hiking
d. Photography

Complete the following short answer questions.

21. What is a natural resource?

22. What is soil?

23. What are three ways that you can conserve water in the home?

a.

b.

c.

24. How does pollution affect wildlife populations?

25. What are three careers in outdoor recreation?

a.

b.

c.

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UNIT VI - PET CARE

Lesson 1: Picking the Proper Pet

Objective: The student will be able to identify factors to consider in selecting a pet.

Study Questions

1. **Why do people have pets?**
2. **What are some common types of pets?**
3. **What factors should be considered in selecting a pet?**
4. **Where can pets be obtained?**
5. **What are some careers in the pet industry?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VI.
2. Activity Sheets

   a) AS 1.1: Pet Selection Factors
   b) AS 1.2: Pet-Related Careers

UNIT VI - PET CARE

Lesson 1: Picking the Proper Pet

TEACHING PROCEDURES

A. Introduction

Pets come in many shapes and sizes. Pets range in size from ants to horses. However, size is only one consideration when selecting a pet. People own pets for many different reasons. This lesson will examine the reasons for having pets and how to select a pet.

B. Motivation (Select one.)

1. Bring some pets such as tropical fish, a turtle, a dog, or a cat into class. Have students discuss these pets and other pets they have owned.

2. Many of the students will have owned pets or have some relationship with a pet. Ask the students to identify pets they have owned. Ask them why they were special to them, how they cared for them, and why they chose that kind of pet.

3. Have a contest among the students to see who has the most unique pet. Have the class vote to determine the winner. The class could have different contests such as a pet photo contest, the largest pet, or the smallest pet.

C. Assignment

D. Supervised study

E. Discussion

Q1. Why do people have pets?

A1.
- **a) To provide companionship**
- **b) To provide enjoyment**
- **c) To help family members relax and reduce stress**
- **d) To help children develop responsibility by caring for pets**
- **e) To perform jobs**
  - **1) Guard dogs**
  - **2) Hunting animals**
  - **3) Pull sleds or wagons**
  - **4) Seeing-eye dogs**

Ask students to describe their pets. Ask them why they own pets. Discuss what benefits people get from pets. Using dogs as an example, have students list the reasons people keep one for a pet. Note that the reasons for having a pet may vary from person to person. Ask students to discuss reasons why some people choose not to own a pet.

Q2. What are some common types of pets?

A2.
- **a) Rodents**
  - **1) Gerbils**

        2) Guinea pigs
        3) Hamsters
        4) Mice
        5) Rabbits
        6) Rats
    b) Larger mammals
        1) Cats
        2) Dogs
        3) Horses and ponies
    c) Amphibians and reptiles
        1) Frogs
        2) Lizards
        3) Snakes
        4) Turtles
    d) Birds
        1) Canaries
        2) Parakeets
        3) Parrots
        4) Pigeons
    e) Fish
        1) Goldfish
        2) Tropical fish
    f) Insects
        1) Ants
        2) Butterflies
        3) Praying mantis
    g) Exotic animals
        1) Llamas
        2) Pot-bellied pigs

Pass around old magazines and have students cut out pictures of animals that could be kept as pets. Use a variety of magazines to get an assortment of pictures. Have the students use the pictures to make a collage on the bulletin board. Limit this exercise to 15 minutes.

Q3. What factors should be considered in selecting a pet?

A3. a) **The time available**
        1) **Time for regular care**
        2) **Time for attention and play**
        3) **Time for special care**
    b) **The space available**
        1) **Space will limit the size of pet that can be owned.**
        2) **Basic container, cage, or house**
        3) **Feeding area**
        4) **Exercise area**
    c) **Money available for expenses**
        1) **Initial purchase expense**
        2) **Feed expense**
        3) **Equipment expense**
        4) **Medical expense**
        5) **Other expenses**
    d) **Interest in a particular type of animal**
    e) **Special skills required**

- f) Restrictions
    - 1) National restrictions
    - 2) State restrictions
    - 3) Local restrictions
    - 4) Housing unit restrictions
- g) Who will care for the pet

Present the students with a situation of an active family living in a two-bedroom apartment. Have students suggest possible pets for that situation. Then, have students discuss what factors need to be considered to own a German shepherd dog or a goldfish. Have students examine all the factors presented in "A3" above. Have students complete AS 1.1. Review student responses on AS 1.1 with the class.

Q4. Where can pets be obtained?

A4.
- a) Pet stores
- b) Animal breeders
- c) Friends
- d) Animal shelter
- e) Humane Society
- f) Newspaper advertisements

Bring to class phone books, newspaper advertisements, fliers from breeders, and a homemade sign saying free kittens. Have students discuss the types of pets they could get from the different sources. Ask them where they have obtained their pets.

Q5. What are some careers in the pet industry?

A5.
- a) Pet food
    - 1) Sales representative
    - 2) Nutrition researcher
- b) Pet supplies
    - 1) Pet equipment developer
    - 2) Pet shop manager
- c) Pet grooming
    - 1) Dog groomer
- d) Health care
    - 1) Veterinarian
    - 2) Veterinary assistant
- e) Animal trainer
    - 1) Hunting dog trainer
    - 2) Horse trainer
- f) Animal producer
    - 1) Dog breeder
    - 2) Cat breeder
    - 3) Horse breeder
- g) Animal manager
    - 1) Zoo keeper
    - 2) Pet shop worker
    - 3) Kennel manager

Bring into class several pet-related magazines and have students identify careers associated with the articles and advertisements. Discuss their findings with the class and identify persons in the local community who work in pet-related career fields. Have students complete AS 1.2.

F. Other activities

1. Allow students to describe their pets to the class. Have students bring small pets in the classroom (in an appropriate container) before school. If larger pets are to be brought to class, arrangements should be made with parents to bring in the animal during the class period.
2. Make a poster with pictures of students' pets or famous pets in the news.
3. Have students write a brief essay about the pet they have or one that they would like. Have students share their essays with the class.

G. Conclusion

People own pets for a variety of reasons. They also own many different kinds of pets such as insects, fish, reptiles, birds, and mammals. When selecting a pet, consider factors such as the time and space available for a pet. Once a decision has been made concerning the type of pet, there are many possible sources for pets.

H. Competency

Identify factors to consider in selecting a pet.

Related Missouri Core Competencies and Key Skills:

8G-12: Prepare a legible, attractive copy of written work and share by reading to special audiences.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

The instructor will need to determine if answers are appropriate.

UNIT VI - PET CARE AS 1.1

Lesson 1: Picking the Proper Pet Name ____________________

PET SELECTION FACTORS

Objective: The student will be able to identify the requirements of owning a selected pet.

Select one of the common types of pets. Rate each of the following factors as they relate to the pet selected. Circle one response.

Type of pet: ________________________________

TIME REQUIREMENTS			
For care	low	medium	high
For attention and play	low	medium	high
For special care	low	medium	high
SPACE REQUIREMENTS			
Feeding area	low	medium	high
Rest area	low	medium	high
Exercise area	low	medium	high
Shelter area	low	medium	high
EXPENSE REQUIREMENTS			
Initial purchase cost	low	medium	high
Feed cost	low	medium	high
Equipment cost	low	medium	high
Medical cost	low	medium	high
Shelter cost	low	medium	high
Other cost (specify) __________________	low	medium	high
SPECIAL SKILLS REQUIRED	low	medium	high
YOUR INTEREST IN THIS TYPE OF PET	low	medium	high
RESTRICTIONS			
National ____________________________	low	medium	high
Sate ________________________________	low	medium	high
Local _______________________________	low	medium	high

Is this pet suitable for your situation? YES NO

UNIT VI - PET CARE AS 1.2

Lesson 1: Picking the Proper Pet Name ____________________

PET-RELATED CAREERS

Objective: The student will be able to identify careers that are pet related.

Use a telephone book and newspapers to identify pet-related careers in the local community. Write the names of persons or businesses in each of the following categories.

Pet shops

1. ______________________________

2. ______________________________

Pet grooming

3. ______________________________

4. ______________________________

Pet training

5. ______________________________

6. ______________________________

Places to buy pet food

7. ______________________________

8. ______________________________

9. ______________________________

Dog-related careers

10. ______________________________

11. ______________________________

Horse-related careers

12. ______________________________

13. ______________________________

Animal hospitals or veterinarians

14. ______________________________

15. ______________________________

Lesson 2: Owner Responsibility with Pets

Objective: The student will be able to describe the responsibilities in owning a pet.

Study Questions

1. **What are basic pet needs?**
2. **What are the responsibilities of owning a pet?**
3. **What are the costs of owning a pet?**
4. **How can pets be trained?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VI.
2. Activity Sheet
    - a) AS 2.1: Estimating Pet Costs

UNIT VI - PET CARE

Lesson 2: Owner Responsibility with Pets

TEACHING PROCEDURES

A. Review

Pets come in many shapes and sizes. People own pets for a variety of reasons. When deciding on a pet, many factors must be considered such as the space, time, and money available for a pet. Regardless of why someone has a pet, the basic needs of the pet must be met. Those needs as well as owner responsibilities will be discussed in this lesson.

B. Motivation (Select one.)

1. Invite a veterinarian, animal shelter worker, or pet owner to class to discuss the responsibilities of owning a pet.

2. Ask a student to bring his or her pet to class and explain how he or she cares for the pet.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are basic pet needs?

A1.
- **a) Balanced diet**
- **b) Clean, fresh water**
- **c) Shelter**
  - **1) Warm and dry for mammals and birds**
  - **2) Aquarium with clean water for fish**
  - **3) Enclosed cage for rodents, amphibians, reptiles, insects, and birds**
- **d) Health care**
- **e) Affection**
- **f) Exercise**
- **g) Special equipment**

Bring examples of pet supplies and equipment to class (e.g., leash, cage, food, bridle, and comb). Ask students to describe basic pet needs. Note that pet owners should understand the basic needs of their pets and be prepared to meet those needs.

Q2. What are the responsibilities of owning a pet?

A2.
- **a) Meeting basic pet needs (food, shelter, space, etc.)**
- **b) Licenses if required**
- **c) Preventive health care**
  - **1) Proper diet**
  - **2) Sanitary environment**
  - **3) Vaccinations**
  - **4) Medical checkups**

d) **Emergency medical care**
e) **Preventing unwanted babies**
f) **Proper waste disposal**

Ask students to identify the responsibilities of owning a pet.

Q3. What are the costs of owning a pet?

A3. a) **Purchase cost**
b) **Food**
c) **Shelter**
d) **Health care**
e) **Equipment**
f) **Other**

Prior to class, develop projected budgets for purchasing and caring for a poodle and a horse for one year. Include feed, medical care, and regular grooming for the poodle. Ask students which of these two animals would cost more to properly maintain for a year. Then discuss how much it would cost to keep each of the two animals. Have students complete AS 2.1. Information to complete AS 2.1 can be obtained from students' parents, pet stores, veterinarians, or animal shelters.

Q4. How can pets be trained?

A4. a) **Toilet training**
b) **Simple commands (speak, fetch, shake hands, sit, roll-over, heel, etc.)**
c) **Birds to talk**
d) **To jump**
e) **To hunt**
f) **To guard property**
g) **Herd animals**

Bring in a pet owner with a well-trained pet (e.g., a talking bird, a hunting dog, a show dog, or a trained horse). Discuss what the animal is trained to do and how it was trained. Ask students to discuss the methods used to toilet train their pets.

F. Other activities

1. Show one of the following filmstrips available from the Missouri Vocational Resource Center.

   a) Small Animal Care: Dogs. Vocational Education Production, 1979.
   b) Beginner's Guide to Buying a Horse. Vocational Education Production, 1979.

2. Go on a field trip to an animal shelter.

G. Conclusion

Pets have basic needs to live and grow. It is the owner's responsibility to meet these needs. Meeting pet needs can result in many expenses. Expenses for the initial purchase and to care for a pet may vary widely. Many pets can be trained to perform in certain ways.

H. Competency

Describe the responsibilities in owning a pet.

Related Missouri Core Competencies and Key Skills:

8B-6: Compute the sum, difference, product, or quotient of integers.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 2.1 - Estimating Pet Costs

The instructor will need to determine if answers are appropriate.

AS 2.1

Lesson 2: Owner Responsibility with Pets

Name ______________________

ESTIMATING PET COSTS

Objective: The student will be able to estimate the cost of owning a pet.

Select one breed of animal for the type of animal selected on AS 1.1. in Lesson one. For example, a German shepherd is a breed of dog. Develop an estimated pet care budget for one year. Include the purchase cost for a pedigreed animal of that breed, food costs, and equipment costs.

TYPE AND BREED OF PET SELECTED: COST ($)

______________________________ $ ☐

EXPENSE

Food (include specific type or types required):

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Shelter (include buildings, pens, etc.):

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Health Care (include checkups, vaccinations, etc.):

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________
4. ______________________________ __________

Equipment (include watering and feeding containers, etc.):

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Other:

1. ______________________________ __________
2. ______________________________ __________
3. ______________________________ __________

Total Cost Per Year $__________

(excluding the cost of the animal)

UNIT VI - PET CARE

Lesson 3: Managing Pets

Objective: The student will be able to identify basic health care needs of pets.

Study Questions

1. **How should pets be groomed?**
2. **What are basic health care needs of pets?**
3. **How can pet diseases be prevented?**
4. **How should I dispose of a pet?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VI.
2. Activity Sheet
    a) AS 3.1: Health Care Schedule

Lesson 3: Managing Pets

TEACHING PROCEDURES

A. Review

Basic pet needs involve requirements for the animal to live and grow, and it is the owner's responsibility to help meet those needs. Feeding, watering, providing medical care, and training are responsibilities of the pet owner. In this lesson, grooming, health care, disease prevention, and pet disposal will be discussed.

B. Motivation (Select one.)

1. Bring in a pet groomer to demonstrate grooming techniques. Have students discuss why bathing and grooming a pet may be important.

2. Bring a veterinarian to class to discuss preventative health care and how to know when an animal needs medical attention.

3. Have a student bring a pet to class to demonstrate how it should be groomed.

C. Assignment

D. Supervised study

E. Discussion

Q1. **How should pets be groomed?**

A1. **a) Bathing**
b) Brushing or combing
c) Clipping or shearing
d) Trimming nails or hooves
e) Special grooming

Bring a bottle of pet shampoo and some grooming tools to show to the class. Ask students why grooming is important to pets. Describe how brushing the hair of animals removes dirt and debris. Brushing also cleans the skin and removes insects such as fleas. Horses must have steel shoes nailed to their hooves to prevent splitting or uneven wear. Cats are often declawed to protect furniture and curtains. Ask students what type of pet requires grooming.

Q2. **What are basic health care needs of pets?**

A2. **a) Vaccinations**
b) Dental care
c) Parasite control (internal and external)
d) Exercise
e) Regular medical checkups

Bring pictures of animals with health problems into class that could have been prevented with proper health care. Have students discuss why good health care is important. Ask students to describe their experiences with bathing, brushing, or worming their pets. Identify problems that can arise as a result of inadequate health care.

Q3. How can pet diseases be prevented?

A3.
- a) **Proper sanitation**
  - 1) **Surroundings**
  - 2) **Equipment**
  - 3) **Water and food**
- b) **Balanced diet**
- c) **Vaccination program**
- d) **Avoid contact with sick animals**

Ask students how they keep in good health themselves. Discuss how those practices relate to pets. Note that diseases are contracted from viruses and bacteria in the environment or transmitted from other sources. Cleanliness is important to reduce the spread of disease organisms. Animals should also be fed a balanced diet to reduce their susceptibility to diseases. Have students complete AS 3.1.

Q4. How should I dispose of a pet?

A4.
- a) **Pets that have died**
  - 1) **Take to veterinarian for disposal**
  - 2) **Pet cemetery**
  - 3) **Burial at home - check local laws**
  - 4) **Cremation**
- b) **Pets that are no longer wanted**
  - 1) **To individuals**
  - 2) **Animal shelter**
  - 3) **Pet shop**
  - 4) **Zoo**
  - 5) **Conservation department**

Bring in a handmade sign "free kittens." Have students discuss what are appropriate ways to dispose of unwanted pets. Ask students to describe their experiences with disposing pets that have died. Note that all pets (whether alive or dead) should be disposed of in a humane and respectful manner.

F. Other activities

G. Conclusion

Grooming and sanitary living conditions are two requirements for a healthy pet. Prevention is the best way to ensure animal health. The use of preventive health care techniques is essential for a complete health care program. If baby pets are not wanted, they should be avoided by neutering the pet. It is easier to prevent unwanted pets than to dispose of them. All pets should be disposed of in a humane and respectful manner.

H. Competency

Identify basic health care needs of pets.

Related Missouri Core Competencies and Key Skills: none

I. Answers to Unit Evaluation

1. d (Lesson 1)
2. a (Lesson 1)
3. a (Lesson 1)
4. b (Lesson 1)
5. d (Lesson 1)
6. c (Lesson 2)
7. d (Lesson 2)
8. a (Lesson 2)
9. d (Lesson 3)
10. c (Lesson 3)
11. b (Lesson 1)
12. d (Lesson 1)
13. a (Lesson 1)
14. c (Lesson 1)
15. Two of the following: (Lesson 1) canaries, parakeets, pigeons, and parrots
16. Three of the following: (Lesson 2)
    a) Meeting basic pet needs
    b) Purchasing required licenses
    c) Giving preventive health care
    d) Giving emergency medical care
    e) Preventing unwanted babies
    f) Proper waste disposal
17. Three of the following: (Lesson 3)
    a) Take to veterinarian for disposal
    b) Pet cemetery
    c) Burial at home
    d) Cremation

J. Answers to AS 3.1 - Health Care Schedule

The instructor needs to determine if answers are appropriate.

Lesson 3: Managing Pets

Name ____________________

HEALTH CARE SCHEDULE

Objective: The student will be able to prepare a health care schedule for a pet.

Using the same animal that you prepared the pet care budget for on AS 2.1 in Lesson 2, plan a schedule for the pet's health care needs. Identify specific types of checkups, vaccinations, etc. Check with your local library, veterinarian, pet store manager, or pet supply representative for information.

Type of Health Care	**Pet's Requirements**
Vaccinations	
Dental	
External Parasite Control	
Internal Parasite Control	
Exercise Needed	
Medical Check-ups	

Name ______________

Date ______________

UNIT EVALUATION

Circle the letter that corresponds to the best answer.

1. Why do people own pets?

   a. For companionship
   b. To help relax
   c. To perform jobs
   d. All of the above

2. Which of the following is a more common pet?

   a. Guinea pigs
   b. Pot-bellied pigs
   c. Field mice
   d. Llamas

3. Which reptiles make good pets?

   a. Turtles, nonpoisonous snakes, and lizards
   b. Rabbits, gerbils, and hamsters
   c. Poisonous snakes, alligators, and frogs
   d. All of the above

4. Which is an important consideration in selecting a pet?

   a. Time, touch, and taste
   b. Time, money, and space
   c. Skill level with animals, time, and education
   d. Animal laws, money, and age

5. Where can pets be obtained?

   a. Pet store
   b. Pet breeders
   c. Friends
   d. All of the above

6. Which of the following is not a basic pet need?

   a. Clean and fresh water
   b. A balanced diet
   c. Pet grooming
   d. A quality home or shelter

7. Which training technique should be started soon after bringing a pet into the home for the first time?

- a. Horses to jump
- b. Dogs to hunt
- c. Birds to talk
- d. Cats to use a litter box

8. What expenses need to be considered when purchasing a pet?

- a. Purchase cost, feed costs, and medical costs
- b. Purchase cost, cost of X-rays, and grooming costs
- c. Equipment costs, medical costs, and therapy costs
- d. All of the above

9. Which of the following is used to prevent diseases in pets?

- a. Dental care
- b. Exercise
- c. Parasite control
- d. Vaccinations

10. How can unwanted baby pets be prevented?

- a. Keeping the pet in a pen
- b. Keeping the pet in a rural area
- c. Neutering the animal
- d. By owning only fish or reptiles

Match the career on the right that corresponds best with the pet career area on the left.

____ 11. Animal manager a. Veterinarian

____ 12. Pet food b. Zoo keeper

____ 13. Health care c. Horse trainer

____ 14. Animal trainer d. Nutrition researcher

Complete the following short answer questions.

15. What are two birds commonly kept as pets?

a.

b.

16. Describe three responsibilities of owning a pet.

a.

b.

c.

17. What are three ways to dispose of a pet that has died?

a.

b.

c.

UNIT VII - LAWN CARE AND EQUIPMENT

Lesson 1: Lawn Care

Objective: The student will be able to identify the elements of a lawn care program.

Study Questions

1. **Why is grass important?**
2. **Where is grass commonly grown?**
3. **What are the two types of grasses and examples of each?**
4. **Where in the U.S. do the two types of grass grow?**
5. **What are six elements of a good lawn care program?**
6. **How is the proper mowing height determined?**
7. **What tools are used in a lawn care program?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VII.
2. Transparency Masters
    - a) TM 1.1: Grass Growing Zones
    - b) TM 1.2: Tools for Lawn Care

UNIT VII - LAWN CARE AND EQUIPMENT

Lesson 1: Lawn Care

TEACHING PROCEDURES

A. Introduction

Lawn care can be a lot of work, but developing a lawn care program and using the proper tools can make it easier. In this lesson, some of the reasons why grass areas are important and also some helpful suggestions to begin a lawn care program will be discussed.

B. Motivation (Select one.)

1. Have a successful young lawn care owner-operator come to the class with his or her equipment. Ask the person to share how he or she got started and the importance of a lawn care program.

2. Bring in several lawn tools to class. Ask students if they know how to use any of the tools. Discuss the use of the tools. (Some unusual examples including a manual reel mower or a weed whip might provide discussion on the changes in lawn care.)

C. Assignment

D. Supervised study

E. Discussion

Q1. Why is grass important?

A1.
- **a) Adds beauty to landscapes**
- **b) Protects the soil against erosion**
- **c) Provides softer, more durable playing areas**

Ask students why grass is important. Discuss their answers; then, lead into how a good lawn care program will provide a beautiful lawn.

Q2. Where is grass commonly grown?

A2.
- **a) Home lawns**
- **b) Businesses**
- **c) Parks**
- **d) Athletic fields**
- **e) Golf courses**
- **f) Along highways**

Give each student three or four magazines and have them cut out pictures of areas that use grass. A variety of magazines should be included: turf magazines, popular magazines, and agricultural magazines. Discuss the pictures and group them on a bulletin board in the six areas.

Q3. What are the two types of grasses and examples of each?

A3.
- a) **Cool-season grasses**
  - 1) **Kentucky bluegrass**
  - 2) **Creeping bentgrass**
  - 3) **Tall fescue**
  - 4) **Perennial ryegrass**
- b) **Warm-season grasses**
  - 1) **Bermudagrass**
  - 2) **St. Augustine grass**
  - 3) **Zoysia grass**

Ask students if they know what type of grass they have on their lawns. Discuss the two main types of grass. Point out that the main difference is that cool-season grass grows best when it is cool (spring and fall) and warm-season grass grows best when it is hot (summer) in Missouri.

Q4. Where in the U.S. do the two types of grass grow?

A4.
- a) **Cool-season grasses grow best in the northern part of the country.**
- b) **Warm-season grasses grow best in the southern part of the country.**

Ask students which part of the country the two types of grass grow best. Discuss the temperature requirements for cool- and warm-season grasses. Ask students why they think it is important to know what type of grass they have in their yards. Point out that this determines how the lawn should be cared for. Use TM 1.1 to point out where the two types of grass grow.

Q5. What are six elements of a good lawn care program?

A5.
- a) **Select a grass for the soil type and growing conditions.**
- b) **Proper fertilization**
- c) **Proper mowing**
- d) **Proper watering**
- e) **Reduce compaction and thatch.**
- f) **Control weeds, diseases, and insects.**

A good lawn care program contains several important factors. Ask the class what elements would be in a lawn care program. List their ideas on the chalkboard. Ask students if their lawns are watered or fertilized.

Q6. How is the proper mowing height determined?

A6.
- a) **Know the type of grass in the lawn.**
- b) **Remove no more than 1/3 of the grass blade at any mowing.**
- c) **Mow warm-season grasses at 1 1/2 inches.**
- d) **Mow cool-season grasses at 2 to 2 1/2 inches in spring and fall and 3 to 3 1/2 in summer.**
- e) **Check with the local extension agent for your area.**

Ask students at what height do they cut their lawns. Discuss how to determine the proper mowing height. Proper mowing height is important in maintaining the health of the lawn.

Q7. What tools are used in a lawn care program?

A7.
- a) **Walk-behind mower**
  - 1) **Reel mower**
  - 2) **Rotary mower**
- b) **String trimmer**
- c) **Sidewalk edger**
- d) **Hedge shears**
- e) **Lawn rake**
- f) **Garden rake**
- g) **Fertilizer spreader**
- h) **Shovel or spade**
- i) **Garden hoe**

Bring in samples of lawn care tools. Demonstrate or discuss how the tools are used in lawn care. Use TM 1.2 to show tools not available.

F. Other activities

1. Show the video Growing Beautiful Lawns available from the Missouri Vocational Resource Center.

2. Have a lawn care expert or the county extension agent talk on lawn care.

3. Have students make a collage of nice lawns and/or lawn care equipment.

G. Conclusion

A beautiful lawn is produced by work and a good lawn care program. Once an appropriate program is developed and implemented, the lawn will become more beautiful.

H. Competency

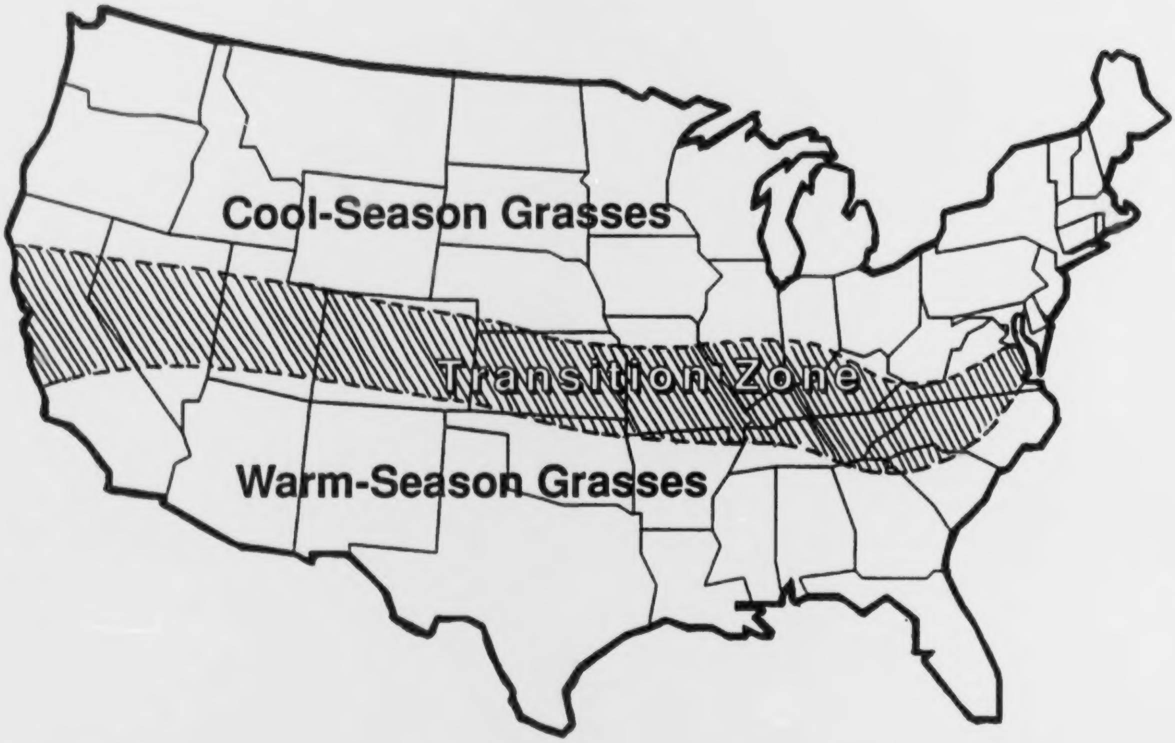
Identify the elements of a lawn care program.

Related Missouri Core Competencies and Key Skills: none

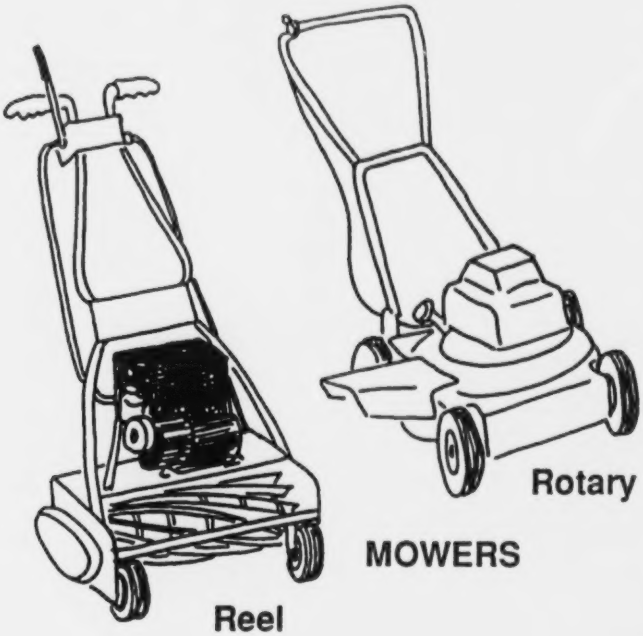
I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

Grass Growing Zones


Cool-Season Grasses
Transition Zone
Warm-Season Grasses

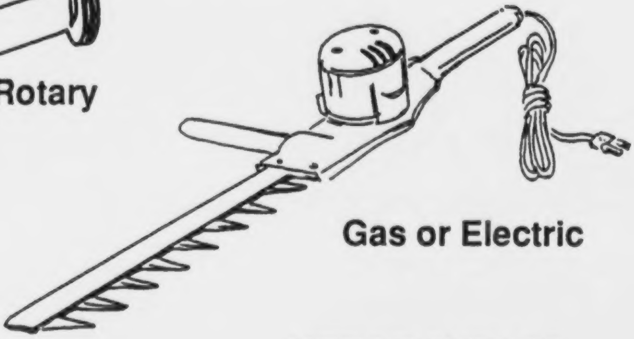
Tools for Lawn Care



Rotary

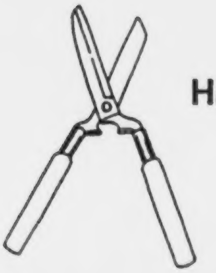
MOWERS

Reel



Gas or Electric

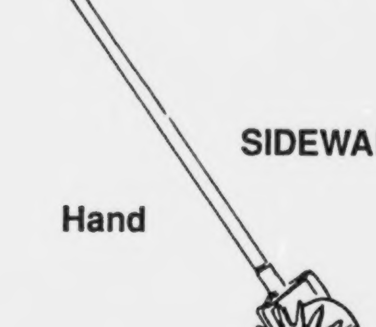
HEDGE SHEARS

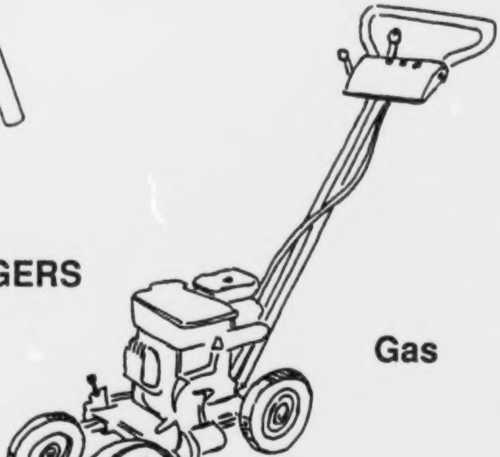


Hand

SIDEWALK EDGERS

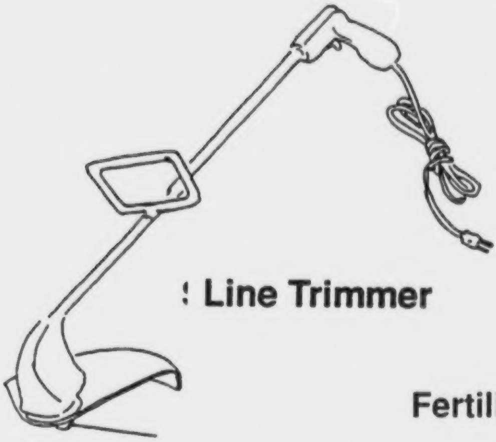
Hand



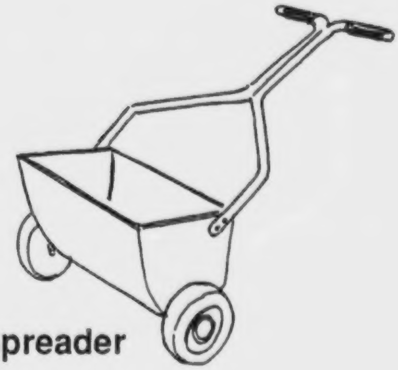


Gas

Tools for Lawn Care

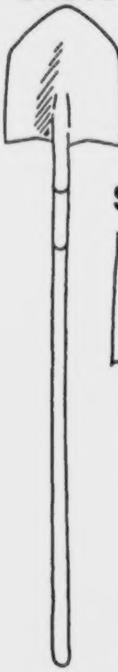


Line Trimmer

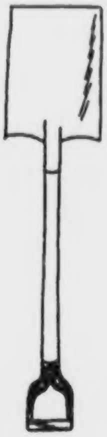


Fertilizer Spreader

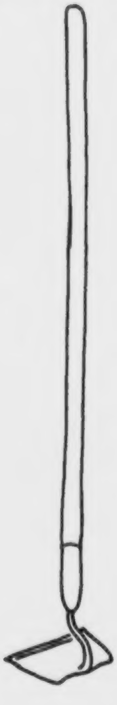
Round-pointed Shovel



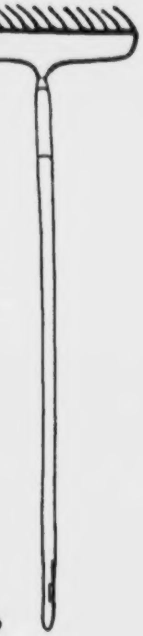
Spade

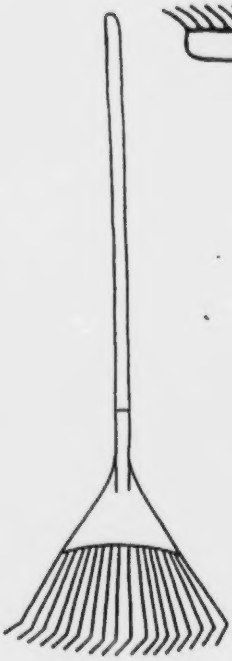


Garden Hoe



Garden Rake





Lawn Rake

Lesson 2: Lawn Mower Safety

Objective: The student will be able to describe safe practices when working with lawn mowers.

Study Questions

1. **Why has lawn equipment changed so much in the last 10 to 15 years?**
2. **What should you wear when operating a lawn mower?**
3. **List five safety precautions to follow before mowing.**
4. **How do most injuries occur when mowing?**
5. **List four safety features on lawn mowers.**
6. **List seven precautions to follow while operating a lawn mower.**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VII.
2. Transparency Master
    a) TM 2.1: Rotary Walk-behind Mower Safety Features
3. Activity Sheets
    a) AS 2.1: Mowing Safety Demonstration (Instructor)
    b) AS 2.2: Lawn Mower Parts
    c) AS 2.3: Lawn Mower Safety Guidelines

Lesson 2: Lawn Mower Safety

TEACHING PROCEDURES

A. Review

Grass areas are very important, and beautiful lawns are generally the result of a good lawn care program. This lesson will discuss safety features and the use of power lawn equipment.

B. Motivation

1. Bring a lawn mower that has the four safety features and an older mower to class. See if the students can identify the safety features and discuss how they will provide for safer mowing.

2. Do a lawn mower safety demonstration. Refer to AS 2.1 for procedure.

C. Assignment

D. Supervised study

E. Discussion

Q1. Why has lawn equipment changed so much in the last 10 to 15 years?

A1. **a) To provide for operator safety**
b) To provide safety for others

Ask the students how lawn mowers have changed. Discuss why these changes have been made.

Q2. What should you wear when operating a lawn mower?

A2. **a) Hard-toed, nonslip shoes or boots**
b) Long pants
c) A shirt

Bring in items of clothing including sandals, hard-toed shoes, shorts, long pants, and tennis shoes. Discuss which pieces of clothing should be worn when mowing. Discuss why the sandals, shorts, and tennis shoes are not safe.

Q3. List five safety precautions to follow before mowing.

A3. **a) Read and understand the owner's manual.**
b) Pick up all loose items from the area to be mowed.
c) Keep people away from the area to be mowed.
d) Check all safety features on the mower.
e) Be sure conditions are OK to mow.
  1) Dry grass
  2) Light enough to see well

Pass around several lawn mower owner's manuals and discuss how they can help provide for safer mowing. Before starting the lawn mower, several steps should be taken to ensure safe operation. Discuss why it is important to remove all trash from the area to be mowed.

Q4. How do most injuries occur when mowing?

A4. **From flying objects from the mower**

Ask students if they know anyone that has been injured in a mower accident. Discuss their responses, then explain that most injuries are due to flying objects from the mower. These objects can travel nearly 200 miles per hour.

Q5. List four safety features on lawn mowers.

A5.
- **a) Grass discharge chute guard**
- **b) Rear guard**
- **c) Automatic stop features**
  - **1) On the handle of the walk-behind mowers**
  - **2) Under the seat on a riding mower**
- **d) Starter handle on mower handle**

Bring a newer model mower into the classroom. Have a student identify the four safety features. Have the class discuss the safety features. Use TM 2.1. Have students complete AS 2.2 to help them become familiar with lawn mower parts.

Q6. List seven precautions to follow while operating a lawn mower.

A6.
- **a) Watch ahead for the unexpected**
- **b) Mow across hills with walk-behind mowers; mow up and down slopes with riding mowers**
- **c) Do not pull the mower towards you**
- **d) Allow the engine to cool before refueling**
- **e) Do not try to mow too fast**
- **f) Do not allow others to ride on riding mowers**
- **g) Do not operate electric mowers in wet conditions**

Ask students what they can do for safer mower operation. Safe operating practices are even more critical during the operation of a lawn mower. Point out what precautions should be followed while operating a lawn mower. Have students complete AS 2.3, Lawn Mower Safety Guidelines.

F. Other activities

1. Bring in booklets and/or posters of different types of power lawn equipment from local lawn equipment dealers. The booklets and posters can be used to identify safety features and functions on different brands of power mowers.

2. Use the "Knowing Mowing" lawn mower safety program from the American Red Cross. It gives students training in lawn mowing safety from trained professionals. The course is 1 1/2 hours in length and leaves students with a certificate of completion.

G. Conclusion

Mowers with safety features have made mowing much safer. Use safe operating procedures to greatly reduce the possibility of accidents or injury.

H. Competency

Describe the safe use of lawn mowers.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

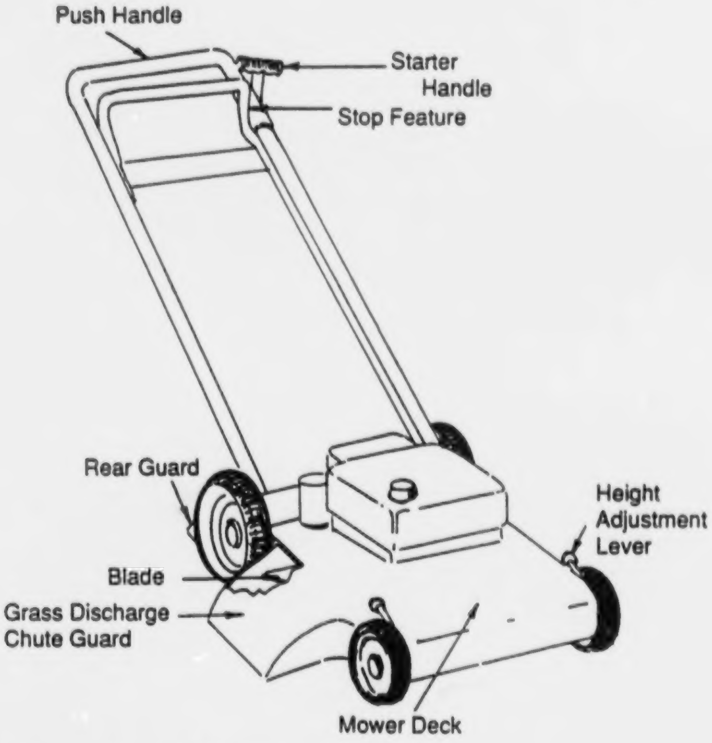
A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

AS 2.1 - Mower Safety Demonstration

no answers

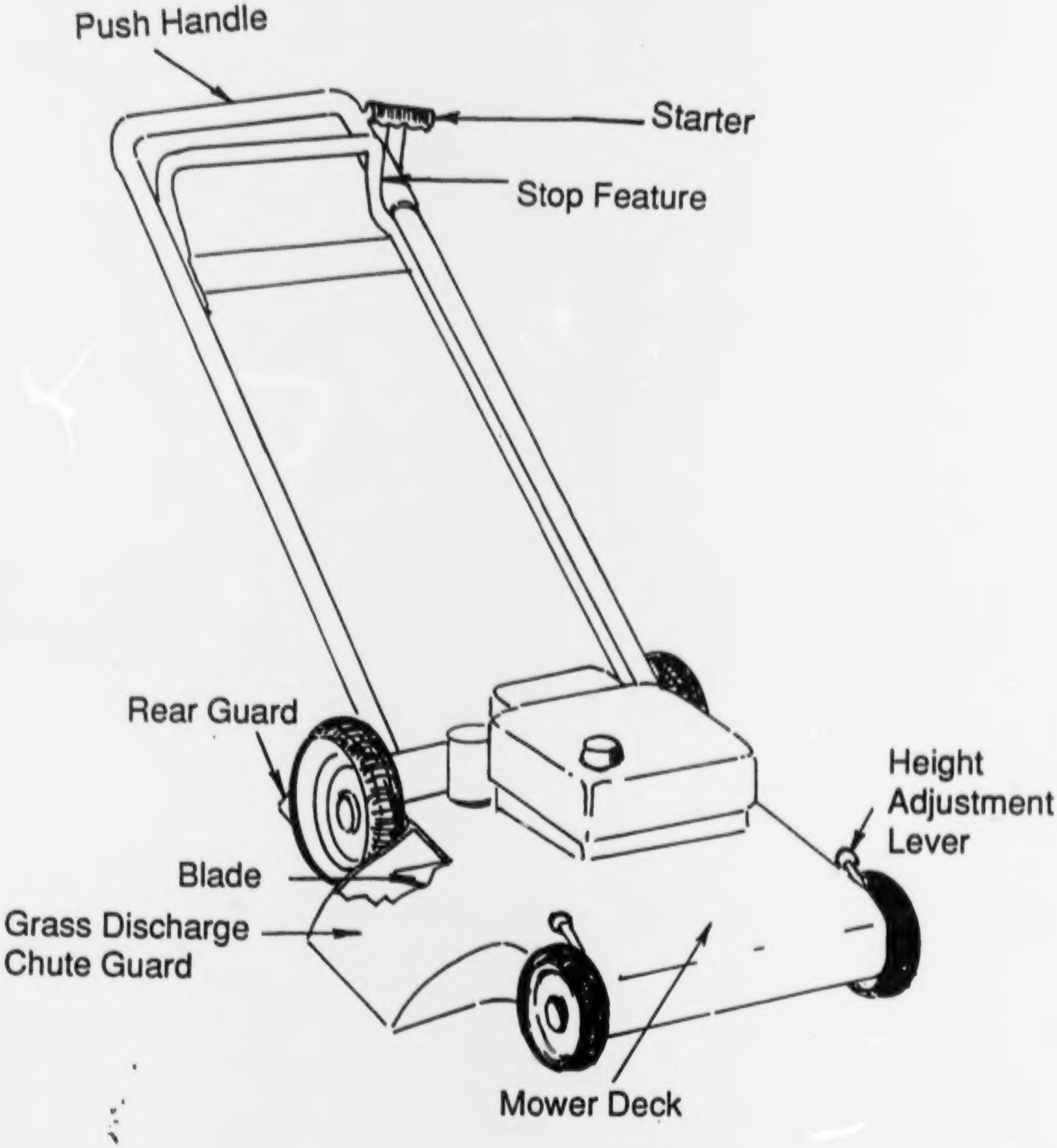
AS 2.2 - Lawn Mower Parts


Push Handle
Starter Handle
Stop Feature
Rear Guard
Height Adjustment Lever
Blade
Grass Discharge Chute Guard
Mower Deck

AS 2.3 - Lawn Mower Safety Guidelines

The instructor will need to determine if answers are appropriate.

Rotary Walk-Behind Mower Safety Features


Push Handle
Starter
Stop Feature
Rear Guard
Height Adjustment Lever
Blade
Grass Discharge Chute Guard
Mower Deck

Lesson 2: Power Mower Safety

MOWER SAFETY DEMONSTRATION

Objective: The student will observe why safety features are so important on lawn mowers.

Use a lawn mower equipped with the four safety features, including the rear guard, to demonstrate how objects can be thrown from a lawn mower.

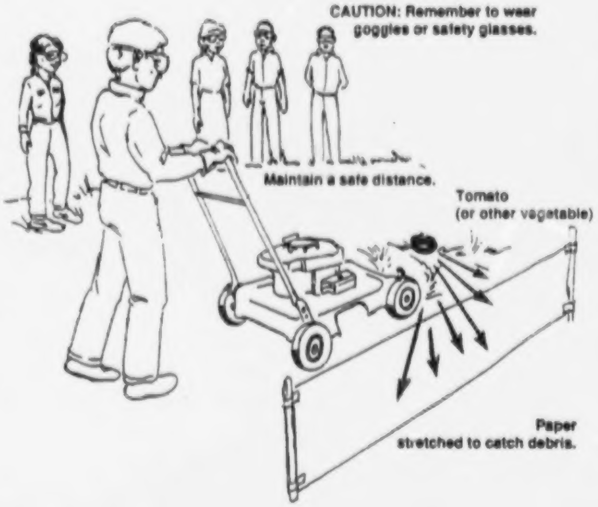
Materials:

Lawn mower
Safety goggles or safety glasses (for all students and the instructor)
2 stakes
6' of paper
Vegetable (potato or tomato)

Procedure:

CAUTION: Emphasize to students that they should not try this at home.

1. The instructor and students should wear goggles to prevent injury.
2. Students should be well away from the demonstration and on the opposite side as the discharge chute.
3. Using two stakes set 6 feet apart, stretch paper across to emphasize the effect of the thrown object.
4. Use a vegetable such as a potato or tomato as the object to be run over.
5. Adjust the mower deck at a low setting. (Make sure the mower is off when adjusting.)
6. Mow over the vegetable.
7. Discuss what would happen if the object had been a rock, stick, or toy.
8. Discuss what would happen to a foot or hand that was accidently run over.


CAUTION: Remember to wear goggles or safety glasses.
Maintain a safe distance.
Tomato (or other vegetable)
Paper stretched to catch debris.

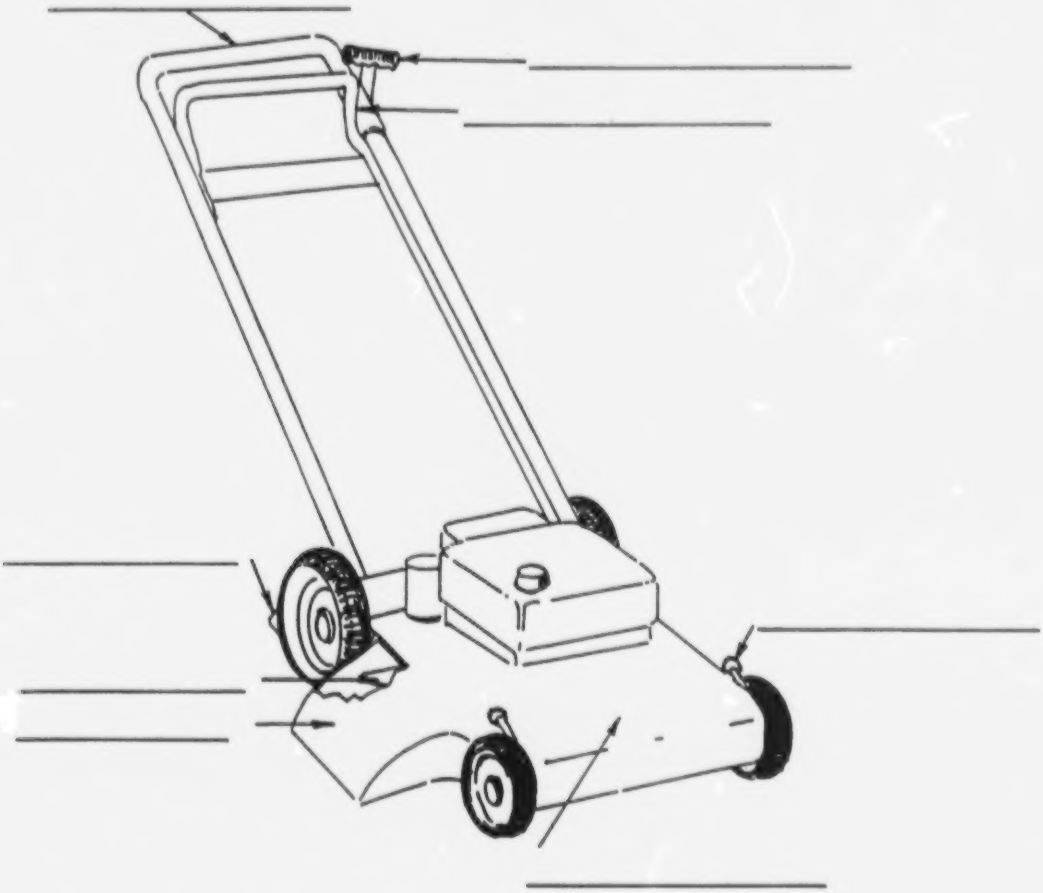
Lesson 2: Power Mower Safety

Name ____________________

LAWN MOWER PARTS

Objective: The student will be able to identify the parts of a lawn mower.

Identify the parts of the mower.



UNIT VII - LAWN CARE AND EQUIPMENT AS 2.3

Lesson 2: Lawn Mower Safety

Name ____________________

LAWN MOWER SAFETY GUIDELINES

Objective: The student will be able to identify mower safety guidelines.

Use owner manuals and basic lawn mower books to help find the following information. Describe safety guidelines that should be followed for each of the following power mower operations.

OPERATION	SAFETY GUIDELINES
1. Starting	a. b. c.
2. Adjusting cutting height	a. b. c.
3. Cleaning under the cutting platform	a. b. c.
4. Refueling	a. b. c.
5. Storage	a. b. c.

UNIT VII - LAWN CARE AND EQUIPMENT

Lesson 3: Lawn Mower Operation

Objective: The student will be able to describe safe procedures for operating lawn mowers.

Study Questions

1. **What is the procedure for starting a gas-powered, walk-behind mower?**
2. **What type of extension cord should be used with an electric mower?**
3. **What is considered the safest way to mow slopes or hills?**
4. **How should the cutting height be adjusted on the walk-behind mower?**
5. **What should be done with grass clippings?**
6. **How should tall grass be cut?**
7. **How should cutting around flower beds, shrubs, and trees be done?**
8. **How should a lawn mower be stored between mowings?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VII.
2. Activity Sheet
    a) AS 3.1: Mowing Obstacle Course (Instructor)

Lesson 3: Lawn Mower Operation

TEACHING PROCEDURES

A. Review

Review lawn mower safety features. With the changes in lawn care equipment over the last 10 to 15 years, the operation of lawn mowers has become much safer. This lesson will give students guidelines for safe starting and operation of lawn mowers.

B. Motivation

What should be done before starting a power lawn mower? (push- or riding-type) Using a lawn mower, attempt to start it without engaging the automatic stop feature. Ask students why it will not start. Explain to students the importance of knowing safe mower operation.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is the procedure for starting a gas-powered, walk-behind mower?

A1.
a) Clear the area of other people, animals, and debris.
b) Start the mower outdoors on a level surface.
c) Hold the mower firmly.
d) Put the throttle in the choke position.
e) Pull the starter handle briskly.
f) When the engine starts, move the throttle to the run position.

Ask students why lawn mowers should be started outdoors and on a level surface. Point out that exhaust fumes can make the operator sick if the area is not well-ventilated. Discuss how to properly start a gas-powered, walk-behind mower.

Q2. What type of extension cord should be used with an electric mower?

A2.
a) The mower owner's manual should give specific guidelines.
b) Mowing with an electric mower is limited by the length of the cord.
c) A rule of thumb is that a 14-gauge, three-prong, heavy-duty extension cord works well.
d) Do not use an extension cord over 100 feet in length.

Bring in several extension cords. Discuss which is the right cord to use. Point out that using the wrong size of extension cord can prevent the mower from operating properly.

Q3. **What is considered the safest way to mow slopes or hills?**

A3. a) **Mow across slopes or hills with walk-behind mowers.**
b) **Mow up and down slopes or hills with riding mowers. Mow only slightly sloping land and be careful. Rolling over with riding mowers is a serious problem.**

Bring in a toy tractor and a piece of plywood. Demonstrate how easily the tractor will tip over going while going across or up and down the hill. Ask why walk-behind mowers should not be used up and down a hill. Discuss why it is important to mow the proper direction on hills and slopes. Point out that some hills are too steep to mow with a riding mower.

Q4. **How should the cutting height be adjusted on the walk-behind mower?**

A4. a) **Adjust cutting height when the mower is turned off.**
b) **A lever on each wheel is moved to change the height of each wheel.**
c) **Sometimes, older mowers need to be adjusted by changing the bolt position in the deck behind the wheel. This generally requires the use of a wrench.**

If possible, demonstrate how to adjust a mower for different cutting heights. Refer to Lesson 1 to determine proper mowing height. Mow a small area and measure the grass with a ruler to show the actual cutting height.

Q5. **What should be done with grass clippings?**

A5. a) **It is best to leave clippings on the lawn.**
b) **Mulching mowers cut grass into small pieces to help reduce thatch.**
c) **Grass should be mowed at the proper height.**
d) **If grass is allowed to grow too tall or if bagging is desired, clippings can be composted.**
e) **Laws are being enacted that will prohibit dumping yard wastes in landfills.**

Ask students whether they bag their grass clippings or not. What do they do with them? Discuss what should be done with grass clippings.

Q6. **How should tall grass be cut?**

A6. a) **Remove any trash or debris from the area to be mowed.**
b) **Set the mower to a higher adjustment.**
c) **Use a sharp blade. If the blade is not sharp, the engine will stall out.**
d) **Blow grass clippings out from the unmowed area to avoid thick build up of clippings.**

Ask students if they have ever had to mow tall grass. Ask what kind of problems they had. Discuss why it is important to check for debris in tall grass. Tall grass can easily hide objects that could damage the mower or hurt the operator. Point out that blowing grass clippings away from the cut grass helps prevent a thick build up that can stall out the mower.

Q7. **How should cutting around flower beds, shrubs, and trees be done?**

A7. **a) Direct the grass discharge chute away from the flower bed.**
b) Be careful not to hit or damage tree trunks with the lawn mower.

If available, show students pictures of trees damaged by a lawn mower. Point out that damaged trees are more susceptible to diseases and insects.

Q8. **How should a lawn mower be stored between mowings?**

A8. **a) Allow the mower's engine to cool down; then clean it off.**
b) Store it inside a garage or tool shed or under a tarp to protect it from the weather.

Point out why it is important to clean the mower between mowings. Discuss how a mower that has been protected from the weather will stay in better condition and require less maintenance. Have students complete the mowing obstacle course as explained on AS 3.1.

F. Other activities

1. Bring a lawn mower and demonstrate the use of it around school grounds.
2. Bring in and demonstrate an electric lawn mower. Show the difference in noise, maintenance, etc.
3. Bring in an abused extension cord and discuss the problems that can be caused by using bad or poorly maintained cords.

G. Conclusion

Safe and correct operation of a mower is essential to getting the job done right. Mowing lawns can be enjoyable if done safely. It can allow an individual to be self-employed.

H. Competency

Describe the safe procedures for operating lawn mowers.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 3.1 - Mowing Obstacle Course

The instructor needs to determine if students complete the course safely.

MOWING OBSTACLE COURSE

Objective: The student will be able to put the mower through a mowing obstacle course.

Set up a mowing obstacle course to enable students to know how to properly use a lawn mower. The instructor needs to determine if students will go through the course with the mower running. If students go through the course without the mower running, they could explain starting and stopping procedures instead of doing them.

The course should include:

1. Adjusting mower height
2. Clearing the mowing area of people and objects
3. Starting the mower
4. Mowing around trees or posts
5. Mowing around a curved bed
6. Stopping the mower

The course should not be timed. Prior to the demonstration/exercise place some objects in the mowing area.

Lesson 4: Lawn Mower Maintenance

Objective: The student will be able to describe maintenance procedures of lawn mowers.

Study Questions

1. **How often should the oil be changed in a lawn mower with a 4-stroke engine?**
2. **How often should the air filter be cleaned and changed?**
3. **How often should blades be sharpened?**
4. **How should lawn mowers be cleaned?**
5. **What should be done to prepare lawn mowers for winter storage?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VII.
2. Activity Sheet
    a) AS 4.1: Examining a Lawn Mower Blade (Instructor)

Lesson 4: Lawn Mower Maintenance

TEACHING PROCEDURES

A. Review

The safe operation of lawn mowers can provide enjoyable mowing. The safe operation of lawn mowers can also reduce injuries to people and damage to landscape plants. Simple maintenance can increase the life of lawn care equipment.

B. Motivation

Discuss with students how much it costs to purchase a lawn mower. Ask how long a person could expect a lawn mower to last. Discuss what can be done to prolong the life of a lawn mower. Use the following examples to illustrate how proper maintenance can increase the life of the mower.

Example: A lawn mower is purchased for $300.00. It is not maintained and only lasts five years. Therefore, it costs, $60.00 a year excluding gas, oil, and air filter. With proper maintenance, the same mower could last ten years. The initial investment would be spread over ten useful years. Thus costing about $30.00 a year excluding gas, oil, and air filter.

C. Assignment

D. Supervised study

E. Discussion

Q1. How often should the oil be changed in a lawn mower with a 4-stroke engine?

A1. a) **With any new lawn mower, the oil should be changed after the first five hours of operation.**
b) **After that, change the oil after 25 hours of operation. If operating conditions are extremely dusty and/or dirty, the oil needs to be changed more often.**
c) **Change the oil at least once a year.**

Oil is very important to an engine. Engines have many internal moving parts that need to be lubricated. Point out that two-stroke engines have the oil mixed with the gas; therefore, this does not apply. Two-stroke engines are lubricated from the fuel mixture.

Q2. How often should the air filter be cleaned and changed?

A2. a) **In most lawn mowers, the air filter should be cleaned every 25 hours of operation. If operating in dusty conditions, the filter may need to be cleaned more often.**
b) **The filter should be replaced when it starts to deteriorate.**

Bring in a variety of filters to show the class. All engines that require a carburetor need the air that travels into that carburetor to be clean and free of dust and dirt. A dirty filter can also inhibit mower operation.

Q3. **How often should blades be sharpened?**

A3. a) **Generally, the blades should be sharpened after 20 to 25 hours of operation.**
b) **The blade should be replaced when the blade is twisted, has lost its lift, or has been severely worn.**

Bring in worn and sharpened blades. Ask which would do a better mowing job. Even though a mower may be tuned and running well, it will not always do a good job cutting the grass, if the blade is not sharp. Keeping the blade sharp also prevents the grass from being damaged when it is mowed off. The instructor can demonstrate how to remove a blade, examine it for wear, and replace it using AS 4.1.

Q4. **How should lawn mowers be cleaned?**

A4. a) **Mowers should be cleaned after each use.**
b) **First allow mowers to cool down completely.**
c) **Brush or wash off gas-powered mowers and allow them to dry.**
d) **Sweep off electric mowers with a broom.**

Discuss how lawn mowers should be cleaned. Keeping the mower in good condition assures that it will be ready for the next job.

Q5. **What should be done to prepare lawn mowers for winter storage?**

A5. a) **Clean off dust, clippings, or debris from engine and upper and lower deck areas.**
b) **Drain all oil from the engine and replace it with new oil. Run engine for a few minutes (5 or so), then shut it off.**
c) **Take out the air filter element, clean it thoroughly, and reinstall it. If necessary replace it with a new one.**
d) **Drain the gasoline tank and carburetor.**
e) **Remove the spark plug and put an ounce of engine oil into the cylinder. Slowly pull the starter handle to allow the oil to cover the cylinder. Replace the spark plug, but leave the wire disconnected.**
f) **Spot lubricate any moving parts such as wheels and throttle cable with a light-weight oil.**
g) **Remove and sharpen blade, then reinstall it.**
h) **Store in a clean and dry place.**

Bring in a mower and demonstrate preparing it for winter storage. Mowers, whether they are gasoline or electric, require care before storage. Refer to the owner's manual for specific instructions for preparing a mower for winter storage.

F. Other activities

1. The teacher could bring in some used motor oil in a clear glass jar and compare it to new motor oil. Have students see and feel the difference between the two. Relate their comments to the engine's lubrication needs.

2. Bring in newspaper or sale articles on power mower prices and compute the cost of mowers.

3. Have students disassemble and reassemble small gasoline engines. Refer to a small engine manual for instructions. (This will take at least five to six weeks.)

4. Demonstrate how to change the oil for a four-stroke gasoline engine.

G. Conclusion

Mowers can be very expensive today. If a lawn mower is not properly maintained, it is very costly and is hard on the equipment. Good maintenance of a lawn mower will help it last longer and do a better job.

H. Competency

Describe maintenance procedures of lawn mowers.

Related Missouri Core Competencies and Key Skills: none

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 4.1 - Examining a Lawn Mower Blade

There are no answers for this activity.

EXAMINING A LAWN MOWER BLADE

Objective: The student will be able to examine a mower blade to determine if it needs sharpening.

Materials:

Lawn mower
Wrench
Wood block
Cone
Sharpened blade

Procedure:

1. The instructor should bring in a lawn mower with a dull blade.
2. Remove the blade with a wrench. A wood block may be used to wedge the blade for loosening.
3. Show students the dull blade. Point out where the lift area is. Also, point out the nicks and dull edges that indicate the blade needs to be sharpened.
4. Using the cone, observe if the blade is balanced.
5. Show students the properly sharpened blade.
6. Compare the sharpened blade to the dull blade.
7. Using the cone, show how the sharpened blade is balanced.
8. Replace the sharpened blade on the mower. Be sure it is securely tightened.

* NOTE: The teacher may show how to sharpen and balance the blade if a grinder is available. Be sure all are wearing safety goggles or safety glasses.

Lesson 5: Trimmer and Edger Safety and Operation

Objective: The student will be able to describe the safe use of power trimmers and edgers.

Study Questions

1. **What are three common lawn and garden power trimmers and edgers?**
2. **What type of clothing should be worn while operating a trimmer or edger?**
3. **What four safety precautions should be followed to operate a trimmer or edger?**
4. **What are the correct steps in starting gas-powered edgers and trimmers?**
5. **What are the correct steps in operating electric trimmers and edgers?**
6. **On what plant materials can power edgers and trimmers be used?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VII.
2. Transparency Master
   - a) TM 5.1: Power Trimmers and Edgers
3. Activity Sheet
   - a) AS 5.1: Safety Guidelines

Lesson 5: Trimmer and Edger Safety and Operation

TEACHING PROCEDURES

A. Review

Proper maintenance will extend the life of lawn mowers. It can be costly to not care for lawn equipment. Many of the operating procedures for mowers also apply to the use of power trimmers and edgers. Power trimmers and edgers can reduce labor over the muscles or stamina needed to operate grass shears, hedge shears, or weed whips.

The focus now is on the safe operation of these trimmers and edgers that can do the job in one quarter the time of the old manual type. Today, an individual can trim hedges and shrubs and edge sidewalks and driveways in less time than it took using the old manual tools.

B. Motivation

Bring in a weed whip and a gas-powered weed trimmer. Have students estimate which tool would cut faster. Also, estimate which tool would cause the operator to become tired more quickly. List some reasons why power trimmers and edgers have replaced hand-operated trimmers and edgers. Have students discuss these tools.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are three common lawn and garden power trimmers and edgers?

A1. a) **Line trimmers - gas and electric**
b) **Sidewalk edgers - gas and electric**
c) **Hedge trimmers - gas and electric**

Show the three common types of trimmers and edgers. With today's lawn tools being so powerful, it is very important to practice safety before, during, and after operating a tool. Use TM 5.1.

A2. What type of clothing should be worn while operating a trimmer or edger?

A2. a) **Safety glasses or goggles**
b) **Nonslip boots or shoes**
c) **Long pants**
d) **Shirt**

When operating power trimmers and edgers, there is a lot of flying objects. The safety shields and guards provide some protection for the operator but not enough. Proper clothing should be worn to help prevent injury to the operator.

Q3. What four safety precautions should be followed to operate a trimmer or edger?

A3. **a) Review operating procedures listed in the owner's manual.**
b) Use the tool only for its specified purpose.
c) Remove debris from the job area before operating the trimmer or edger.
d) Be aware of the surroundings and be prepared for the unexpected.

Ask students what precautions should be followed while operating a trimmer or edger. There are many things to consider before and during the operation of a power tool. Care must be taken to prevent accidents.

Q4. What are the correct steps in starting gas-powered edgers and trimmers?

A4. **a) Be sure the blades or line head area is clear.**
b) Place throttle on choke.
c) Pull the starter handle.
d) As the engine starts to run, switch off the choke.
e) Adjust the engine speed.

Bring some trimmer and edger operating manuals to pass around to class. Ask students what are the correct steps in starting gas trimmers and edgers. Discuss the appropriate answers.

Q5. What are the correct steps in operating electric trimmers and edgers?

A5. **a) Plug the tool into a grounded extension cord.**
b) Make sure the blades or line head is clear of obstacles.
c) Pull the trigger switch to start.

Bring some trimmer and edger operating manuals to pass around to class. Ask students what are the correct steps in starting gas trimmers and edgers. Discuss the appropriate answers. Ask how electric trimmers are different from gas trimmers.

Q6. On what plant materials can power edgers and trimmers be used?

A6. **a) The power of the tool and the size of line or type of blade will determine what the tool can be used on.**
b) Most line trimmers and sidewalk edgers are made to cut smaller weeds and grass.
c) Cutting blades on trimmers can cut woody plants up to 2" in diameter depending on the trimmer.
d) Hedge trimmers usually can cut 1/4" branches.

Bring in different types of cutting heads or blades and discuss what materials can be cut. If this is not possible, show slides of different plant materials that need trimming. Ask students to identify which tool would be used on each.

F. Other activities

1. Compare the safety features on new trimmers and edgers to those on older tools.
2. Ask a local lawn and garden equipment dealer for a power trimmer and edger demonstration.

3. Bring in and compare electric- and gas-powered string trimmers.

4. Demonstrate the safe use of power trimmers and edgers.

G. Conclusion

Power trimmers and edgers are more commonly used today and should be operated safely. Always follow the guidelines recommended by the manufacturer when operating trimmers and edgers.

H. Competency

Describe the safe use of power trimmers and edgers.

Related Missouri Core Competencies and Key Skills: none

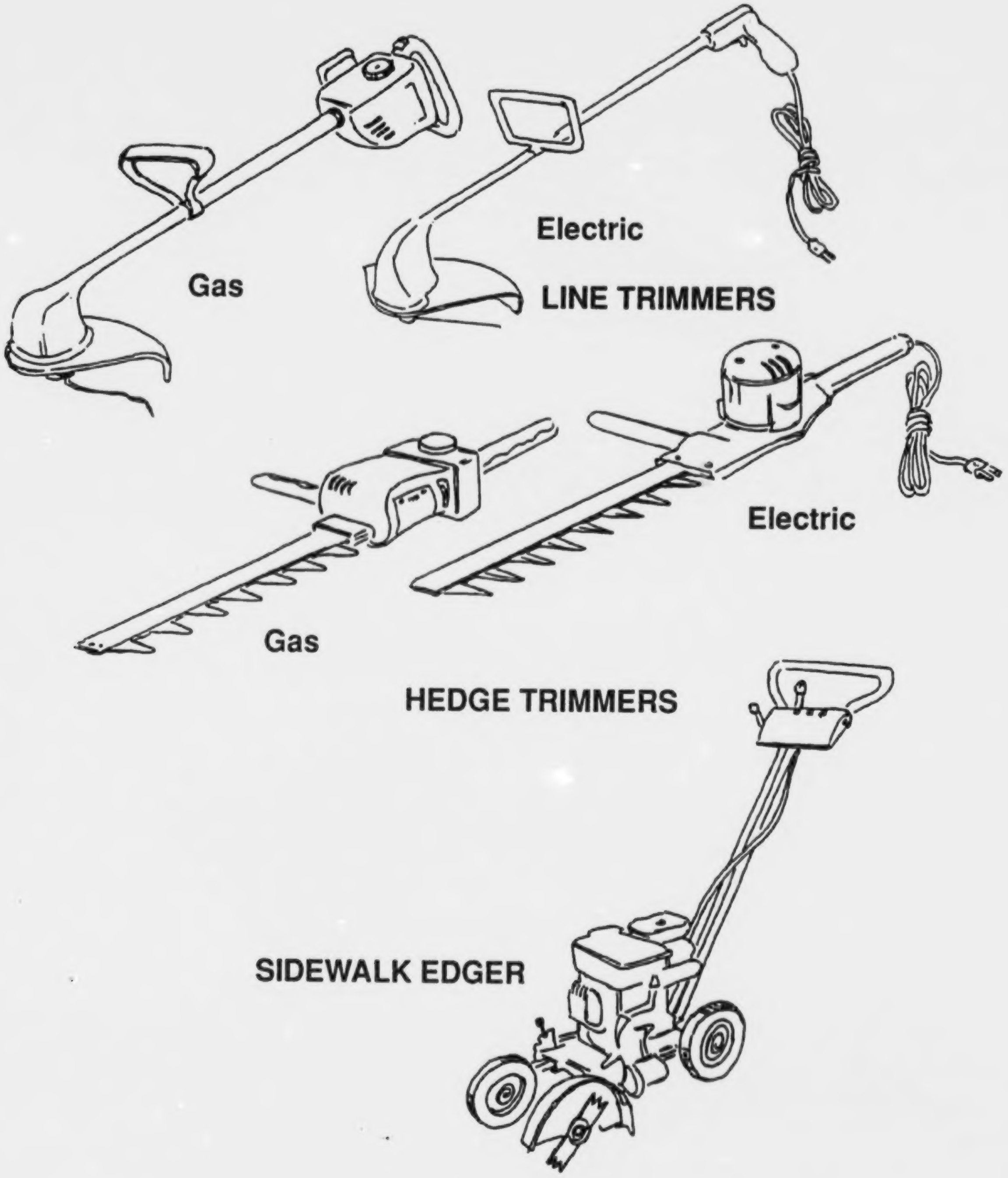
I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers for AS 5.1 - Safety Guidelines

The instructor will need to determine if answers are appropriate.

Power Trimmers and Edgers


Electric
Gas
LINE TRIMMERS
Electric
Gas
HEDGE TRIMMERS
SIDEWALK EDGER

Lesson 5: Trimmer and Edger Safety and Operation

Name ______________

SAFETY GUIDELINES

Objective: The student will be able to list safety guidelines for line trimmers and hedge trimmers.

Use owner's manuals to find six safety guidelines for using line trimmers and hedge trimmers.

LINE TRIMMERS

1.

2.

3.

4.

5.

6.

HEDGE TRIMMERS

1.

2.

3.

4.

5.

6.

Lesson 6: Trimmer and Edger Maintenance

Objective: The student will be able to describe the proper care of trimmers and edgers.

Study Questions

1. **What type of fuel is needed for 2-stroke engines?**
2. **When are the blades sharpened or the lines replaced?**
3. **How are edgers and trimmers cleaned and stored?**

Reference

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VII.

Lesson 6: Trimmer and Edger Maintenance

TEACHING PROCEDURES

A. Review

Power line trimmers, edgers, and hedge trimmers have come into common use and need to operated safely, due to the danger of sharp blades and flying objects. These tools should also be cared for properly. This lesson will present information about maintaining powered edgers and trimmers.

B. Motivation

Ask students why oil is added to the gasoline in the 2-stroke engine. Point out the difference between gas and gas mixed with oil. The instructor could demonstrate how to the mix the oil into the gas.

C. Assignment

D. Supervised study

E. Discussion

Q1. What type of fuel is needed for 2-stroke engines?

A1. a) **The fuel is a mixture of oil and gasoline.**
b) **Follow the manufacturer's recommendations on the type of oil, type of gasoline, and amount of oil to be used.**
c) **Be sure the gas and oil are mixed well by shaking the container vigorously.**

Discuss why it is important to mix the gas and oil properly. If possible, bring in gas and oil and show students how to mix them properly. Do it in a well-ventilated area.

Q2. When are the blades sharpened or the lines replaced?

A2. a) **The line on line trimmers should be replaced if it is old and dried out.**
b) **The line should be refilled when it runs out or becomes too short to use.**
c) **Blades should be kept sharp. If they become damaged or worn out, they should be replaced.**

Bring in a line trimmer and the owner's manual. Follow the procedure in the owner's manual to demonstrate how to replace a line on a trimmer.

Q3. How are edgers and trimmers cleaned and stored?

A3. a) **Clean all surfaces.**
b) **Clean air filter and replace it if it is old or damaged.**
c) **Empty fuel tank and carburetor. (gasoline types)**
d) **Lubricate moving parts.**
e) **Sharpen blade or replace line when necessary.**
f) **Store it in a clean and dry place.**

Bring in an edger or trimmer and demonstrate how to prepare it for storage. Discuss the importance of cleaning and storing edgers and trimmers properly.

F. Other activities

Ask a local lawn and garden business mechanic to talk about the importance of edger and trimmer maintenance. Have the mechanic demonstrate how to replace the line on a string trimmer and change cutting heads.

G. Conclusion

Proper maintenance can help keep edgers and trimmers in good condition and ready for operation whenever needed.

H. Competency

Describe the proper care of edgers and trimmers.

Related Missouri Core Competencies and Key Skills: none

I. Answers to Unit Evaluation

1.	F	(Lesson 1)
2.	F	(Lesson 1)
3.	T	(Lesson 1)
4.	F	(Lesson 1)
5.	T	(Lesson 1)
6.	T	(Lesson 1)
7.	T	(Lesson 5)
8.	F	(Lesson 5)
9.	T	(Lesson 5)
10.	b	(Lesson 2)
11.	c	(Lesson 2)
12.	a	(Lesson 2)
13.	d	(Lesson 2)
14.	c	(Lesson 2)
15.	c	(Lesson 3)
16.	c	(Lesson 3)
17.	c	(Lesson 4)
18.	b	(Lesson 4)
19.	c	(Lesson 4)
20.	c	(Lesson 4)
21.	d	(Lesson 4)
22.	c	(Lesson 5)
23.	c	(Lesson 6)
24.	b	(Lesson 6)
25.	d	(Lesson 6)
26.	3 1 2 4	(Lesson 3)

Name ________________

Date ________________

UNIT EVALUATION

True or False (Place the correct response in the blank.)

____ 1. Turfgrass can be found only around homes.

____ 2. Lawn care programs are very technical and should be left to trained professionals to develop and maintain.

____ 3. It is important to know the type of grass in the lawn when planning a lawn care program.

____ 4. Grasses are classified as humid and arid grasses.

____ 5. A good rule of thumb for mowing height is to cut the top 1/3 of the total grass blade length.

____ 6. Mowing height can affect the health of the grass.

____ 7. One should never play with trimmers and edgers.

____ 8. The throttle should be in the "run" position when starting a gas-powered edger.

____ 9. When operating trimmers and edgers, match the tool to the job.

Circle the letter that corresponds to the best answer.

10. What safety device must be held in place before a new mower will start?

    a. Rear guard
    b. Automatic stop feature
    c. Deflector shield
    d. Spark plug

11. When purchasing a lawn mower, what safety feature(s) should the mower have on it?

    a. Tube type tires
    b. Non-adjustable handle
    c. Rear guard
    d. Electric start

12. What should the operator wear when operating a power lawn mower?

    a. Nonslip shoes or boots and long pants
    b. Nonslip shoes or boots and shorts
    c. Any clothing will do
    d. Sun glasses

13. What is the most common cause of injury from lawn mower operation?

    a. Hot muffler
    b. Hot weather
    c. Mower blade
    d. Thrown objects

14. Which of the following is the most important thing the operator should know before using a lawn mower?

    a. The weather forecast
    b. Is there enough fuel to complete the job?
    c. How to operate the machine safely
    d. The size of the yard

15. What is considered the safest way to mow on slopes or hills with a walk-behind mower?

    a. Diagonally on the hills or slopes
    b. Up and down the hills or slopes
    c. Across the hills or slopes
    d. Direction doesn't matter

16. Which of the following is a part of preparing a mower to be stored between uses?

    a. Immediately after use, put mower into storage area to cool off.
    b. Hose off the machine to cool it down quicker, then put it into the storage area.
    c. Allow the mower to cool down, then clean it off.
    d. Refill with gasoline before cooling.

17. How often should the engine oil in lawn mowers be changed under normal working conditions?

    a. Every three months of operation
    b. Every 10 hours
    c. Every 25 hours
    d. Every 35 hours

18. What is the purpose of oil-dampening an air filter element?

    a. Provide oil to lubricate the carburetor's parts
    b. Keep dirt and dust out of the carburetor
    c. Provide oil to lubricate the engine
    d. Provide the oil mixture for the gasoline

19. How often should the cutting blade of the lawn mower be sharpened?

    a. Every time the mower is used
    b. Every third time the mower is used
    c. Every 25 hours of operation
    d. Every 12 hours of operation

20. Where should an electric mower be stored?

a. Anywhere
b. Outside
c. In a dry, clean place
d. Under the back porch

21. Why do two-stroke engines need to have oil mixed into the gasoline?

a. To keep the carburetor clean
b. To produce smoke
c. To help in fuel consumption
d. To lubricate internal engine parts

22. What should the operator wear when using a power trimmer?

a. Nonslip boots or shoes and long pants
b. Nonslip boots or shoes, shorts, and safety glasses
c. Nonslip boots or shoes, long pants, and safety glasses
d. Nonslip boots or shoes, shorts, and sun glasses

23. When using a two-stroke line trimmer, gasoline without the oil mixture ______________.

a. Can be used if the job is a small one
b. Can be used if it is not dusty
c. Can never be used
d. Can be used if it is damp outside

24. Power hedge trimmers can be used to ______________.

a. Cut off large tree limbs
b. Trim hedges up to 1/4" diameter
c. Mow small patches of grass
d. Trim around lakes and streams

25. Which of following statements is true about preparing trimmers for storage?

a. Fill the gasoline tank so that the trimmer is ready for next season.
b. Take the engine apart to lubricate it.
c. Place the trimmer on blocks to wash it.
d. Clean and replace air filters so that the trimmer is ready for next season.

26. Place in the correct order (1 through 4) the procedure to start a gas-powered, walk-behind lawn mower. (1 = first procedure step, 4 = last procedure step)

____ Pull starter handle.

____ Move mower outside.

____ Place control in choke position.

____ Adjust motor speed.

UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT

Lesson 1: Fire Safety

Objective: The student will be able to discuss fire safety procedures.

Study Questions

1. **What are the common causes of fires?**
2. **What are four types of fires?**
3. **How are fire extinguishers classified?**
4. **What is the proper maintenance for fire extinguishers?**
5. **Where should fire warning systems be installed in the home?**
6. **What are the four steps in developing a home fire escape plan?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VIII.
2. Activity Sheets
    a) AS 1.1: Fire Safety Checklist
    b) AS 1.2: Fire Safety Floor Plan and Escape Route

Lesson 1: Fire Safety

TEACHING PROCEDURES

A. Introduction

Home fires often kill people. More people die from inhaling smoke, toxic fumes, or suffocation than from burns resulting from a fire. Fire safety, therefore, should focus on preventing fires before they start. This lesson will examine the causes of fires and procedures to improve fire safety.

B. Motivation (Select one.)

1. Invite fire department personnel to motivate students on the importance of fire safety and use of fire extinguishers. Direct the speaker to address the following topics: the common causes of fires, different types of fires the their causes, different types of fire extinguishers, and proper maintenance for fire extinguishers.

2. Every year, many homes are lost to fires. What can be done to prevent this hazard of fires? Get students to share their experiences and suggestions.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are the common causes of fires?

A1.
a) Careless smoking
b) Heating systems
c) Frayed electrical cords
d) Electrical shorts and overloads
e) Stacks of old papers and magazines
f) Piles of oily rags
g) Improperly stored flammable liquids
h) Cooking

Fires can be ignited from a variety of sources. Being aware of the causes of fires is the first step toward prevention. Have students complete AS 1.1.

Q2. What are four types of fires?

A2.
a) Type A - Ordinary combustibles (wood, cloth, paper, rubber, many plastics, and other common materials that burn easily)
b) Type B - Flammable liquids (gasoline, oil, grease, tar, oil-based paint, lacquer, and flammable gas)
c) Type C - Electrical equipment (energized electrical equipment, wiring, fuse boxes, circuit breakers, and machinery)
d) Type D - Combustible metals (metal and metal dust) often used in industry

Fire safety and fire prevention begin with an understanding of the types of fires. Discuss the different types of fires. Identify locations in the home where each type of fire may occur.

Q3. How are fire extinguishers classified?

A3. a) **Extinguishers approved for one type of fire**
  1) **Type A - for use on ordinary combustibles**
  2) **Type B - for use on flammable liquids**
  3) **Type C - for use on electrical equipment**
  4) **Type D - for use on combustible metals**
b) **Extinguishers approved for multiple fire types**

Just as there are different types of fires, there are different types of fire extinguishers. Fire extinguishers need to be matched with the type of fire. Show several types of fire extinguishers. Point out that information on the extinguisher indicates the type of fire it will extinguish. Note that persons should not use a special type fire extinguisher on any other type of fire. However, some extinguishers have been designed for use on several different classes of fires. Each type of fire extinguisher should be located in the area of the home in which the type of fire is most likely to start. (e.g., Type B in kitchen or garage)

Q4. What is the proper maintenance for fire extinguishers?

A4. a) **Check the mechanical condition of the fire extinguisher every month**
b) **Check the pressure (level of charge)**
c) **Recharge if necessary**
d) **Properly dispose of undercharged disposable types and purchase a new one**

Fire extinguishers should be checked for proper operation. Contents of fire extinguishers are under pressure. Low levels of pressure will limit the effectiveness of the unit. Show students how to read the gauge on the extinguisher to check for proper pressure. Demonstrate how the fire extinguisher should be aimed at the base of the fire during use.

Q5. Where should fire warning systems be installed in the home?

A5. a) **Heat detectors - Placed high in the kitchen, furnace room, garage, attic, and utility room**
b) **Smoke detectors - Placed high on the ceiling in hallways outside of sleeping areas with one on every level**

Have students read and answer the question. Divide class into pairs and pass out smoke detectors to each pair. Smoke detectors may be purchased or borrowed from the fire department, an insurance company, or a hardware store. Have students install batteries. (Some batteries should be dead.) Have students test their smoke detectors for proper operation. Discuss the importance of checking the detectors on a monthly basis for proper operation. Collect smoke detectors from students.

Q6. What are the four steps in developing a home fire escape plan?

A6. a) **Survey the inside and outside of your home.**
b) **Draw a floor plan of your home including all windows and doors.**

c) Plan appropriate escape routes and alternate routes for each bedroom.
d) Have each family member practice the escape routes.

A fire escape plan is vital for the safety of all occupants of a home. Have students draw a floor plan for their home (AS 1.2). Ask students to use arrows to identify escape routes for each room. Encourage students to take home their plans and practice the plan with each member of the household.

F. Other activities

1. Get in touch with the local fire department so they can come and demonstrate fire safety.

2. Do a demonstration outside with the proper extinguisher and a flammable liquid.

3. Bring to class a smoke detector and a heat detector. Demonstrate the operation of the heat detection unit and the smoke detection unit.

G. Conclusion

Fires in the home can be very costly. Proper planning can reduce the risk and damage of a home fire. Fire extinguishers should be located in areas where fire hazards are the greatest. Extinguishers should be examined on a regular basis to make sure they are working properly. Checking for and eliminating fire hazards in the home will help reduce the risk of a fire.

H. Competency

Discuss fire safety procedures.

Related Missouri Core Competencies and Key Skills:

8G-4: Follow a series of instructions in sequential order.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to Activity Sheets

AS 1.1 - Fire Safety Checklist

Answers will vary.

AS 1.2 - Fire Safety Floor Plan and Escape Route

Answers will vary.

UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT AS 1.1

Lesson 1: Fire Safety

Name ____________

FIRE SAFETY CHECKLIST

Objective: The student will identify fire hazards in the home.

Review each of the sources of home fires listed below. Assess your home to determine if any of the common sources of home fires are present. If you identify the presence of one or more fire sources, describe the steps you took to eliminate the hazard.

		Check One	
		YES	NO
a.	Careless smoking	___	___
b.	Dirty/unventilated space heaters or stove	___	___
c.	Frayed electrical cords	___	___
d.	Overloaded electrical circuits	___	___
e.	Stacks of old newspapers and magazines	___	___
f.	Piles of oily rags	___	___
g.	Open containers of flammable liquids	___	___
h.	Careless cooking (grease fire)	___	___

For items checked YES above, what steps did you take to eliminate the problem?

Lesson 1: Fire Safety

Name ______________

FIRE SAFETY FLOOR PLAN AND ESCAPE ROUTE

Objective: The student will draw a fire escape route for his or her home.

Draw an accurate floor plan of your household and including all floors (levels), windows, and doors. Then, from this floor plan, establish one primary escape route. Use arrows to identify an escape route from each room in the household. Also, include the place where everyone is to meet outside in case of a fire.

Lesson 2: Electrical Energy and Safety

Objective: The student will be able to explain precautions for the safe use of electricity in the home.

Study Questions

1. **What is electricity?**
2. **How is electricity generated and transported?**
3. **How is electricity use measured?**
4. **What is a fuse?**
5. **What is a circuit breaker?**
6. **How do incandescent and fluorescent light bulbs differ?**
7. **What hazards are associated with electrical use?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VIII.
2. Transparency Master
    a) TM 2.1: Reading an Electric Meter
3. Activity Sheet
    a) AS 2.1: Electrical Safety Checklist

Lesson 2: Electrical Energy and Safety

TEACHING PROCEDURES

A. Review

Review the importance of having a fire safety plan for the home. Note that one of the major causes of home fires is electricity. This lesson will discuss how electricity is generated, transported, and used. Also, helpful hints on electrical safety will be discussed. Electricity is energy we cannot see, but we can measure its power and potential. The world has changed since electricity was discovered and harnessed for human use.

B. Motivation (Select one.)

1. Ask students to identify the different ways they use electricity to get ready for school. Ask students, "How would you cook your meals, clean your home, and heat your water? What would you do for entertainment if you didn't have a television?" List their ideas on the chalkboard.

2. Invite a person from the electrical provider (e.g., Union Electric, Electric Cooperative, and City Electric) to describe where electricity comes from. Have the speaker discuss how electricity is generated and transported to homes. Ask speaker to do a measurement demonstration.

C. Assignment

D. Supervised study

E. Discussion

Q1. What is electricity?

A1. A form of energy, caused by the movement of electrons through a conductor.

Electricity, as a source of energy, can be used to perform several functions. Electric lights help to illuminate areas during periods of darkness. Electric motors provide power to perform tasks in a variety of settings. Electric heaters can provide warmth, and fans are used to circulate air. Electronic switches, sensors, and control devices have been developed to monitor activities and processes in a variety of settings.

Q2. How is electricity generated and transported?

A2. a) Generated
- **1) Water power (hydroelectric)**
- **2) Steam power**
- **3) Burning fossil fuels (natural gas, oil, and coal)**
- **4) Nuclear power**
- **5) Geothermal (heat from underground)**
- **6) Burning waste**
- **7) Batteries**
- **8) Internal combustion engines**

9) **Wind power**
10) **Solar power**

b) **Transported - Electricity is transported through distribution lines on poles above ground or underground.**

Nature has its own way of producing electrical energy in the form of lightening during "electrical storms." Benjamin Franklin is credited with making the first attempt to harness electrical power with a key attached to his kite string. People are continually searching for ways to generate electricity. Discuss the ways of generating electricity. Discuss how the electricity in the local community is generated. Identify where other generation procedures may be used.

Q3. How is electricity use measured?

A3. **Electrical use is measured in units of watt-hours commonly called kilowatt-hours.**

A metering device that measures the amount of electricity is attached to a home. If possible, locate a meter within walking distance to show what it looks like. Discuss how the kilowatt-hours are read from the meter.

The measurement of electricity is analogous to measuring the flow of water. Voltage is the measure of electrical "pressure" in a circuit. Amperage is the measure of electrical "flow." Electrical use is computed by multiplying the pressure times the flow (i.e., volts times amps) which yields watts. Electrical use is measured in kilowatts (i.e., 1,000 watts.) Kilowatt hours are the amount of kilowatts of electricity used over time. One kilowatt hour represents the use of 1,000 watts of electricity over a one hour time period. Use TM 2.1 to illustrate how to read an electric meter.

Q4. What is a fuse?

A4. **A fuse contains a metal strip which melts and breaks the circuit when excess current flows into a circuit.**

Once electricity is safely delivered to our homes, steps must be taken to manage its power. Bring in several types of fuses and discuss their differences. There are common plug fuses, tamper-resistant fuses, and cartridge fuses. The purpose of the fuse is to provide a means of protection to a given wiring system. If there is an overload or short circuit problem in a circuit, the fuse will blow before there is overheating of any part of the wiring system. Note that fuses must be replaced after they have blown. Discuss the importance of replacing a blown fuse with the same kind of fuse, not a larger one.

Q5. What is a circuit breaker?

A5. **A circuit breaker is a switch that trips when excess current passes through it.**

A circuit breaker works the same way as the fuse. If there is an overload in the circuit, the circuit breaker will trip, thus stopping the flow of current in the circuit. One difference between the circuit breaker and the fuse is that the circuit breaker does not need to be replaced, just reset. Another type of circuit breaker is the GFCI (Ground Fault Circuit Interrupter), which is more sensitive and more efficient circuit breaker. The main function of the GFCI is to protect people from stray or short circuit currents and protect equipment and wiring from large currents. The National Electric Code (section 210-8) requires ground-fault protection for all 120 volt, single-phase, 15 to 20 amp receptacle outlets that are installed outdoors and in bathrooms for residential occupancies. Bring in circuit breakers, including a GFCI. Discuss how they work. Note that circuit breakers must be reset, but do not need to be replaced after they are tripped.

Q6. How do incandescent and fluorescent bulbs differ?

A6. a) **Incandescent light bulbs heat a filament wire inside the bulb.**

b) **Fluorescent bulbs radiate light from a gas contained in the bulb after electricity passes through it.**
   (a) **Higher efficiency - more light per watt when compared to incandescent**
   (b) **Less heat is developed.**
   (c) **It is better suited to recessed lighting.**
   (d) **Tubes are available in a variety of colors.**
   (e) **The average life of fluorescent tubes is longer than incandescent bulbs.**
   (f) **Less expensive**

Bring in an incandescent bulb and fixture to demonstrate how they work. Bring in a fluorescent bulb and fixture to demonstrate how they work. Note that one-third of the world's energy is used by the U.S. and one-third of that energy is used for residential needs. Therefore, energy conservation should be a consideration when purchasing light bulbs.

Q7. What hazards are associated with electrical use?

A7. a) **Electrical shock**
b) **Fire**

There are many uses of electricity in the home. The abuse of this power can be dangerous. Discuss what steps should be taken to ensure the safe use of electricity in the home. Understanding how electricity functions should help persons to recognize potential hazards. Have students complete AS 2.1 to conduct an electrical safety check in their home. Have students report the results of the survey to the class.

F. Other activities

1. Bring in a circuit tester, ammeter, or voltmeter. Demonstrate how they work and how electricity is measured.

2. Using an instructor-made electrical circuit board, show how a circuit works.

3. Demonstrate how a circuit breaker or fuse protects any overloaded circuit.

G. Conclusion

Electricity and all the conveniences it brings, help people's lives. Often, this source of power is overlooked and not respected. Such negligence can result in injury. The use of electrical energy is unmatched by any other power source. Safe use of electric power requires several precautions be taken to avoid shock or fire hazards.

H. Competency

Explain precautions for the safe use of electricity in the home.

Related Missouri Core Competencies and Key Skills: none

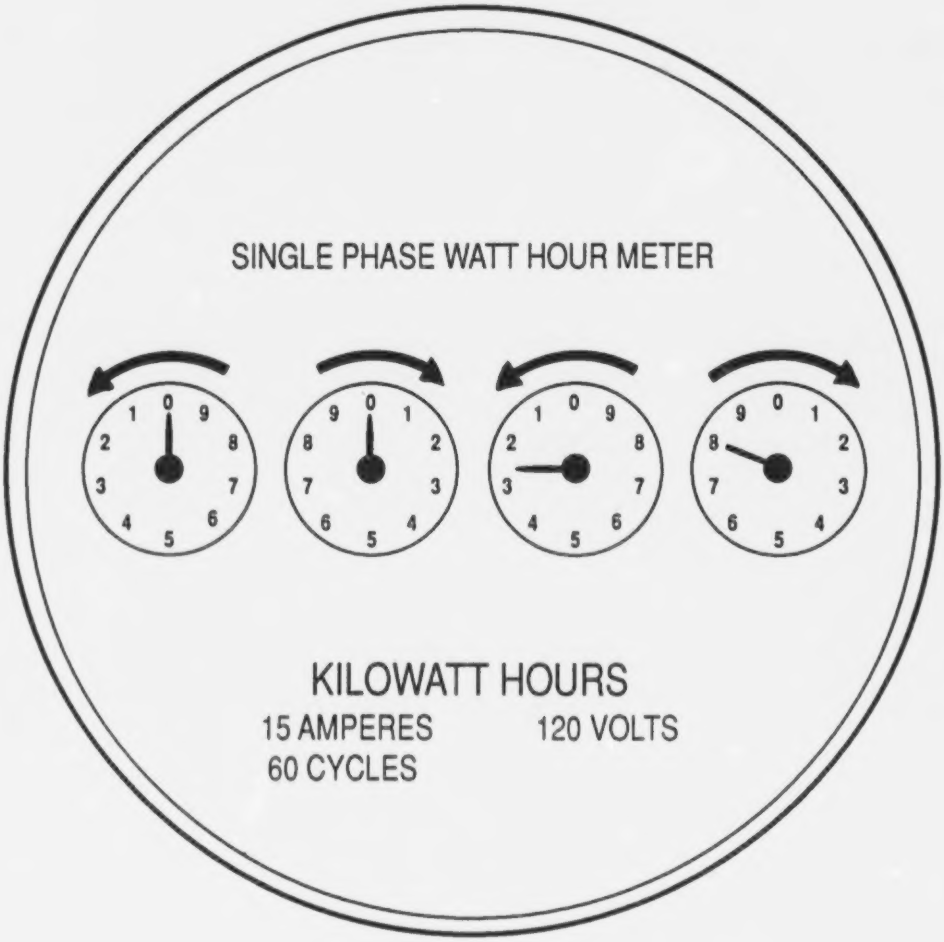
I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 2.1 - Electrical Safety Checklist

Answers will vary.

Reading an Electric Meter


SINGLE PHASE WATT HOUR METER
1 0 9 2 8 3 7 4 5 6
9 0 1 8 2 7 3 6 5 4
1 0 9 2 8 3 7 4 5 6
9 0 1 8 2 7 3 6 5 4
KILOWATT HOURS
15 AMPERES
120 VOLTS
60 CYCLES

Reading = 0028

Note: The arrows denote the rotation of the hands on each dial.

Lesson 2: Electrical Energy and Safety

Name ____________________

ELECTRICAL SAFETY CHECKLIST

Objective: The student will identify potential electrical hazards in the home.

Survey your home using the following list of safety precautions to identify potential electrical hazards. Place a check mark in the blank before each statement which is properly observed in the home.

Safety Precautions

____ 1. Do not tamper with or by-pass safety features on electrical tools and/or appliances.

____ 2. Do not touch electrical tools or appliances with wet hands or feet.

____ 3. Do not remove the third prong (ground prong) on a three-prong plug in.

____ 4. Install GFCI on all kitchen, bathroom, laundry, and outdoor circuits.

____ 5. Do not use extension cords which are worn, frayed, or get warm during use.

____ 6. Do not place extension cords under a rug or carpet.

____ 7. All electrical installations are according to the National Electric Code Specifications.

____ 8. Use only double-insulated or three-prong (grounded) cord power tools and appliances.

____ 9. Correct problem before resetting circuit breaker or replacing fuse.

____ 10. Use the appropriate size of fuse/circuit breaker for each circuit. (Do not use one with a larger amperage rating.)

____ 11. Do not leave heat-producing appliances unattended while operating (i.e., toaster, iron, hair dryer, etc.).

____ 12. Keep heaters and lamps away from combustible materials.

____ 13. Keep metal appliance enclosures grounded at all times.

____ 14. Never remove the back of a television set.

____ 15. Keep electronic motors free of dirt and grease build-up and well-lubricated.

____ 16. Keep electric appliances and tools dry to avoid shock hazards.

____ 17. Replace switches, outlets, fixtures, or extension cords which are cracked or damaged.

____ 18. Do not operate electrical equipment in wet conditions.

____ 19. Use caution when handling long objects (i.e., ladders, pipe, lumber, etc.) to avoid overhead power lines.

____ 20. Use caution when digging in areas where power lines may be buried.

____ 21. Avoid the use of multiple plug adapters in electrical outlets.

What electrical hazards did you identify?

How were they corrected?

Lesson 3: Conserving Resources in the Home

Objective: The student will be able to describe ways to conserve resources in the home.

Study Questions

1. **What resources are used in the home environment?**
2. **How are resources used in the home environment?**
3. **How can resources be conserved in the home environment?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VIII.
2. Activity Sheet
    a) AS 3.1: Home Energy Audit

Lesson 3: Conserving Resources in the Home

TEACHING PROCEDURES

A. Review

In the previous lesson, electrical use and safety were discussed. In this lesson, conserving electricity and other natural resources will be discussed. Homes built today, unlike those built in the 1940s and 1950s, are more energy-efficient, but they can be even more energy-efficient.

B. Motivation

Ask students to identify resources that are used in the home. Common ways of wasting resources in homes are: leaving lights on in rooms, holding the refrigerator or freezer door while looking for something to eat, leaving door or window open while the air conditioning is on, or letting the water run in the sink while brushing teeth. Ask students if they have done any of these things.

C. Assignment

D. Supervised study

E. Discussion

Q1. What resources are used in the home environment?

A1.
- **a) Electricity**
- **b) Water**
- **c) Natural gas**
- **d) Fuels**

Many households have become conscientious of the resources which are used to operate the home environment. Some resources are directly consumed, while others are used indirectly. Electricity use indirectly involves the resources that were utilized to generate the electric power. Water, natural gas, and fuel use in the home involve a direct usage of those resources.

Q2. How are resources used in the home environment?

A2.
- **a) Electricity - cooking, watching television, washing and drying clothes, listening to the stereo, vacuuming, washing dishes, heating or cooling the home, reading with the light on, etc.**
- **b) Natural gas - cooking, heating the home and water, drying clothes, etc.**
- **c) Fuels - heating the home, propane in barbecue grills, gasoline and diesel fuel to operate vehicles, etc.**
- **d) Water - taking showers; washing clothes, dishes, and the car; brushing one's teeth; watering the garden and yard; etc.**

Water is a precious resource that is needed to sustain life. Supplies of water have become contaminated in many areas, and must be processed before it can be consumed by humans. There is increased attention in protecting and preserving the quality of our water resources.

Q3. How can resources be conserved in the home environment?

A3. a) **Adjust thermostats of heating and air conditioning units.**
b) **Insulate walls, doors, windows, and water heaters.**
c) **Caulk door and window frames and exterior cracks and joints.**
d) **Reduce electricity use.**
e) **Reduce water use.**

Homes built today should be more energy conserving than homes built earlier. Although construction methods and techniques have improved over the years, older homes can be made more energy-efficient. Measures can be taken to improve energy efficiency in older homes, also. Have students complete AS 3.1. Have students list appliances in their home, the resource each uses, and the average hours of use each day.

F. Other activities

1. On a state map, locate the community's electrical generating plant and diagram for students the path by which the generated electricity gets to their homes.

2. Have students prepare a short report on an alternative energy sources that could be used in homes. Example: Solar or wind generators

3. Have students clip newspaper articles dealing with energy conservation, home construction, or new, energy-efficient appliances. (Example: heat pumps, triple-paned windows, etc.)

4. Have students calculate the amount of water wasted by a dripping faucet or the amount of electricity used by a light bulb over a one year period.

G. Conclusion

Electricity, water, and fuels are used in many ways in the home environment. Homes can be modified to use energy more efficiently and reduce the use of natural resources.

H. Competency

Describe ways to conserve resources in the home.

Related Missouri Core Competencies and Key Skills:

7C-5: Draw logical conclusions and make generalizations based on available information.
8C-5: Make inferences, draw conclusions, make generalizations, and predict outcomes based on available information.

I. Evaluation

A unit test is provided at the end of this unit. If a lesson quiz is needed, use questions pertaining to this lesson from the unit test.

J. Answers to AS 3.1 - Home Energy Audit

Answers will vary.

Lesson 3: Helping Homes Conserve Natural Resources Name__________________

HOME ENERGY AUDIT

Objective: The student will be able to identify ways to conserve energy in the home.

List all of the appliances in your home. Then list the resource used and the average number of hours of operation each day. See example below. Next, list recommended conservation measures to conserve each of the resources listed.

		Appliance	Resource Used	Avg. Hrs. Used Daily
Ex.:	1.	Stove	Electricity	3
	2.			
	3.			
	4.			
	5.			
	6.			
	7.			
	8.			
	9.			
	10.			

Recommended Conservation Measures:

Electricity	Water
Natural Gas	Fuels

UNIT VIII - HOME ENVIRONMENTAL MANAGEMENT

Lesson 4: Home Maintenance Tool Kit

Objective: The student will be able to identify common household tools.

Study Questions

1. **What are some common hand tools and their uses?**
2. **What safety precautions should be taken when using hand tools?**
3. **What are standard units of measure?**

References

1. Exploring Agriculture in America (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991. Unit VIII.
2. Activity Sheet
    - a) AS 4.1: Area Calculations

Lesson 4: Home Maintenance Tool Kit

TEACHING PROCEDURES

A. Review

Review previous lesson on conserving energy around the home. In this lesson, the types and uses of hand tools and their safety practices will be presented. Standard measuring units will also be discussed.

B. Motivation

Bring in ten hand tools and have the class identify them and tell what they are used for. Demonstrate the correct use of a tool to the class.

C. Assignment

D. Supervised study

E. Discussion

Q1. What are some common hand tools and their uses?

A1.
- **a) Hammers - driving nails and pulling nails**
- **b) Pliers - gripping and/or turning objects**
- **c) Screwdrivers - installing or removing screws**
  - **1) Flat head**
  - **2) Phillips head**
- **d) Handsaws - cutting wood; metal, or plastic materials**
- **e) Wrenches - to tighten and loosen bolts and nuts**
  - **1) Combination wrenches**
  - **2) Socket wrenches**
- **f) Measuring tools - determining dimensions of specific areas**

There are many types of hand tools. Each tool is designed for a specific job. Most common jobs around the home require only a few tools. Tools should only be used for the intended purpose. Using tools for purposes other than for what they were intended may cause personal injury or damage to the tool.

Q2. What safety precautions should be taken when using hand tools?

A2.
- **a) Safety glasses should be worn at all times.**
- **b) Use the proper tool for the job.**
- **c) Inspect tools before using them .**
- **d) Keep tools clean.**
- **e) Store tools in properly marked areas.**
- **f) Keep cutting tools sharp.**

Safety precautions should always be used when working with tools. Always use the proper tool for the job. Using a tool in a manner that it was not designed may cause damage to the tool or injure the operator.

Q3. What are standard units of measure?

A3. a) **English system - yards, feet, inches**
    1) **Square yards**
    2) **Square feet**
    3) **Board feet**

  b) **Metric scale - meters, centimeters, millimeters**

When doing jobs around the home, accurate measurements are important. Properly calculating the amount of materials needed for a job can save both time and money. The proper use of measurement tools is necessary to calculate the materials needed to complete a job. Have students complete AS 4.1.

F. Other activities

1. Bring in an assortment of hand tools. (Those covered in class and others.) Demonstrate and discuss the correct and safe use of each tool.
2. Make a small project (birdhouse, bird feeder, etc.). Kits can be purchased for students to assemble. (This activity is also included in Environment and Resource Conservation.)
3. Demonstrate measuring. Measure and figure board feet. Also measure selected lengths of boards or objects to the nearest sixteenth inch.
4. Calculate amount of square feet in the classroom to determine the amount of carpet or the wall space to determine how much wallpaper or paint required to redecorate the room.
5. Have a hardware store employee bring a sample of nails, screws, bolts, etc. to class and describe the use of each.

G. Conclusion

Most common repairs needed around the home do not require an extensive tool selection. However, some larger jobs may require contacting a trained individual. The home owner is confronted with those small jobs that need immediate attention. Having a home maintenance tool kit on hand can be very helpful.

H. Competency

Identify common household tools.

Related Missouri Core Competencies and Key Skills:

8D-6: Calculate the perimeter or the area of a triangle, rectangle or square.
8H-3: Solve problems involving area and perimeter in consumer situations.

I. Answers to Unit Evaluation

1.	F	(Lesson 1)
2.	T	(Lesson 1)
3.	T	(Lesson 1)
4.	F	(Lesson 3)
5.	T	(Lesson 3)
6.	T	(Lesson 4)
7.	F	(Lesson 4)
8.	T	(Lesson 4)
9.	F	(Lesson 4)
10.	F	(Lesson 4)
11.	c	(Lesson 2)
12.	a	(Lesson 2)
13.	b	(Lesson 3)
14.	b	(Lesson 1)
15.	a	(Lesson 1)
16.	d	(Lesson 1)
17.	c	(Lesson 1)
18.	c	(Lesson 2)
19.	e	(Lesson 2)
20.	b	(Lesson 2)
21.	d	(Lesson 2)
22.	a	(Lesson 2)

23. The instructor will need to verify additional answers. (Lesson 1)
    a. Clean up clutter around home.
    b. Don't smoke in bed.
    c. Use electrical appliances properly.
    d. Have the heating system checked.
    e. Keep flammables properly stored.

24. Four of the following: hydroelectric, burning fossil fuels, wind power, geothermal, burning wastes, batteries, internal combustion engines, nuclear power, steam power, and solar (Lesson 2)

25. The instructor will need to determine if answers are appropriate. (Lesson 3)

26. Hammers, pliers, screwdrivers, handsaw, measuring tape (Lesson 4)

J. Answers to AS 4.1 - Area Calculations

1. a. 8 ft. x 16 ft. = 128 sq. ft. x 2 walls = 256 sq. ft.
   8 ft. x 12 ft. = 96 sq. ft. x 2 walls = 192 sq. ft.
   256 sq. ft. + 192 sq. ft. = 448 sq. ft. of surface

   b. door area: 3 ft. x 6 ft. = 18 sq. ft.
   window area: 2 ft. x 3 ft. = 6 sq. ft.
   448 sq. ft - (18 sq. ft. + 6 sq. ft.) = 424 sq. ft. of surface to paint

   c. 424 sq. ft. ÷ 200 sq. ft./gallon = 2.12 gallons of paint
   You would need to purchase 2 gallons and 1 quart of paint.

2. a. 18 ft. x 20 ft. = 360 sq. ft.
   360 sq. ft. ÷ 9 sq. ft./sq. yd. = 40 sq. yds. of carpet

   b. 18 ft. x 20 ft. = 360 sq. ft.
   360 sq. ft. ÷ 9 sq. ft./sq. yd. = 40 sq. yds. of padding

   c. carpet: 40 sq. yds. x $6.00/sq. yd. = $240.00
   padding: 40 sq. yds. x $1.00/sq. yd. = $40.00
   $240.00 + $40.00 = $280.00 total cost

3. a. 10 ft. x 8 ft. = 80 sq. ft. for one wall
   15 ft. x 8 ft. = 120 sq. ft. for the second wall
   80 sq. ft. + 120 sq. ft. = 200 sq. ft. to be covered with paneling

   b. area of sheet of paneling: 8 ft. x 4 ft. = 32 sq. ft.
   200 sq. ft. ÷ 32 sq. ft./sheet = 6.25 sheets of paneling
   You would need to buy 7 sheets of paneling to complete this job.

   c. $9.00/sheet x 7 sheets = $63.00

Lesson 4: Home Maintenance Tool Kit

Name ______________

AREA CALCULATIONS

Objective: The student will be able to calculate areas to determine the amount of materials needed.

Correctly calculate each problem. (Show your work.)

When purchasing materials to complete a home maintenance project, the exact amount of materials cannot always be purchased because of the way materials are packaged. Therefore accurate calculations are important in order to purchase enough materials without purchasing too much. The following information is provided:

Floor area = length x width
Wall area = length x height
9 sq. ft. = 1 sq. yd.

1. If one gallon of paint covers 200 sq. ft., how many gallons of paint will you need to purchase in order to completely cover a room that has 2 walls that measure 8 feet tall by 16 feet long and 2 walls that measure 8 feet tall by 12 feet long? There is one window that measures 2 feet by 3 feet and one door that measures 3 feet by 6 feet that will not need painting.

   a. total square feet of wall space =

   b. total square feet to be painted =

   c. total gallons of paint required =

2. You have decided to carpet the living room. The room measures 18 feet wide by 20 feet long. You will need padding and carpet. The padding costs $1.00 per square yard and the carpet costs $6.00 per square yard.

   a. How many square yards of carpet will be needed?

   b. How many square yards of padding will be needed?

   c. How much will the materials cost?

3. You want to panel two walls in a room in your house. One wall measures 10 feet long by eight feet tall. The other wall measures 15 feet long by eight feet tall. Your paneling comes in sheets four feet by eight feet and costs $9.00 per sheet.

   a. How many square feet has to be covered by paneling?

   b. How many sheets of paneling would you need to purchase to cover these areas?

   c. What is the cost for the paneling only?

Name ________________

Date ________________

UNIT EVALUATION

True or False (Write in the correct response in the blank provided.)

____ 1. A smoke detector should be installed at least 24 inches from the ceiling.

____ 2. A heat detector should be installed in the attic.

____ 3. Smoke detectors should be installed in hallways outside of bedrooms.

____ 4. Natural gas can only be used to heat homes.

____ 5. Propane is one fuel that is used in barbecue grills.

____ 6. Always wear safety glasses when using tools.

____ 7. The metric system is the most commonly used method to calculate areas and material needs.

____ 8. When using a tool, always use the proper tool for the job.

____ 9. If the hand saw is dull, force it to get the job done.

____ 10. Small screwdrivers are best to use on large screws.

Circle the letter that corresponds to the best answer.

11. How is electricity transported from the generating plant to the consumer?

    a. Air waves
    b. Sound waves
    c. Conductor wires
    d. Electrician's truck

12. How is the use of electricity at the home measured?

    a. Kilowatt-hours
    b. Amount of appliances owned
    c. Size of home using the electricity
    d. Type of heating and air conditioning used

13. Which resource is not used in the home?

    a. Electricity
    b. Gasoline
    c. Natural gas
    d. Water

Match the cause of fire to the correct type of fire.

____	14.	Type A	a.	Flammable liquids, gasoline, oil, grease, tar and oil based paints.
____	15.	Type B	b.	Ordinary combustibles, wood, cloth, paper, rubber and plastics.
____	16.	Type C	c.	Combustible metals and metal dust.
____	17.	Type D	d.	Electrical equipment, wiring, fires, circuit breakers and machinery.

Match the correct term with its function.

____ 18. A sensitive and efficient method of circuit protection that is required in certain areas of the home.

____ 19. A process that involves secondary radiation, gaseous discharge and electrical stimulation

____ 20. A device that trips when protecting an overloaded circuit

____ 21. A process that involves the flow of electrical current through a filament to produce light.

____ 22. A device that, if overloaded, blows out.

a. Fuse

b. Circuit breaker

c. Ground fault circuit interrupter

d. Incandescent lighting

e. Fluorescent lighting

Complete the following short answer questions.

23. List five steps that can be taken to prevent fires in the home.

a.

b.

c.

d.

e.

24. Name four ways in which electricity can be generated.

a.

b.

c.

d.

25. What are four things that you can do to conserve resources in the home?

a.

b.

c.

d.

26. List five tools commonly found in a home tool kit.

a.
b.
c.
d.
e.

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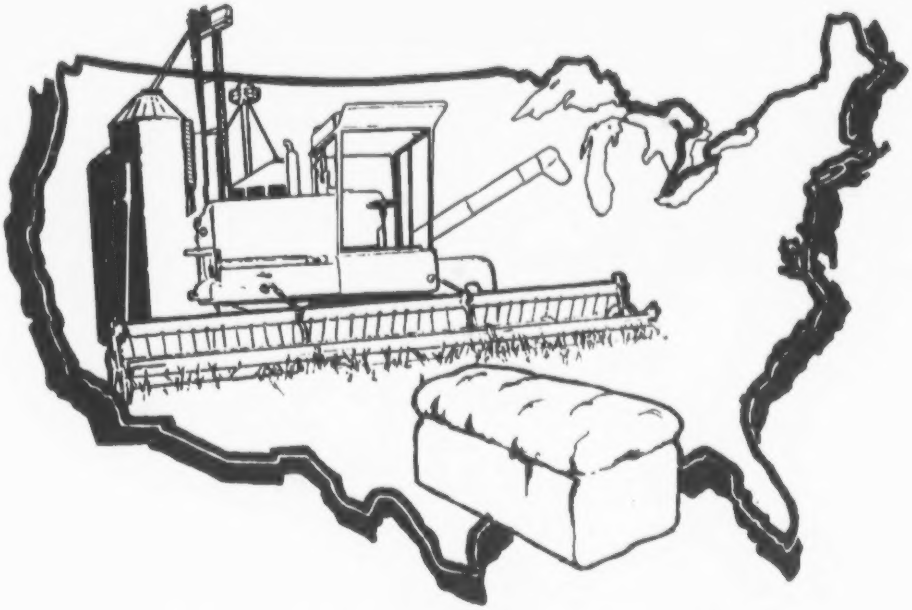
EXPLORING AGRICULTURE IN AMERICA



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FOREWORD

Instruction about agriculture is important for the development of an educated citizenry. Every person has a vested interest in agriculture. The future of human beings is directly dependent upon agriculture. Exploring Agriculture in America was developed to inform students about the industry which is so vital to their future.

This student reference contains eight units: Agriculture in America, Animals in Society, Plants in Our Environment, Products from Agriculture, Environment and Resource Conservation, Pet Care, Lawn Care and Equipment, and Home Environmental Management.

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EXPLORING AGRICULTURE IN AMERICA

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Lesson 1:
Agriculture in America

The goal of agriculture has not changed since farming began. The goal is to provide food and fiber for human use. In earlier times, if yields were good, farmers would sell excess products to neighbors or townspeople. Today, agriculture produces food, fiber, and many other important products.

Agriculture - What is it?

The term agriculture is derived from Latin words meaning the science and art of cultivating the soil. This definition may have described agriculture in the early days of our nation, but times have changed.

Changes in society, the demand for more food, and a greater variety of foods have prompted changes in agriculture. A more appropriate definition of agriculture is: all activities involved in the production, processing, distribution, and marketing of food and fiber products. This includes persons who provide services to farmers. There are a variety of jobs and opportunities in agriculture. The industry of agriculture provides many benefits for individuals and the nation.

Importance of Agriculture

Agriculture is the largest industry in the U.S. In addition to producing and processing quality food and fiber products for U.S. and world consumers, agriculture provides much more. The U.S. agricultural industry employs over 20 million people. Over 17 million of the jobs are involved in transporting, processing, storing, and merchandizing farm products. The industry of agriculture is larger than the steel, transportation, and auto industries combined.

Agriculture generates millions of dollars of taxes. Taxes help support the local, state, and national governments. Many rural school districts receive a major portion of their funding from agricultural property taxes.

Each year U.S. consumers spend over $444.5 billion on food and fiber products produced in the U.S. The average American spends 16.2 percent of their disposable income on food. For every $1.00 an individual has to spend, slightly over 16 cents is spent on food. Americans spend less on food than people in other countries. This is possible because of high production levels, new technology, efficient transportation and many other factors. Table 1.1 shows how much U.S. consumers spend on food compared to other countries.

Table 1.1 - Percentage Spent on Food

Country	Average Percentage of Disposable Income Spent to Purchase Food Products
Korea	52
China	50
India	50
Thailand	48
Venezuela	40
Greece	40
Italy	38
Japan	30
Norway	26
Australia	26
France	26
Sweden	23
Canada	22
Denmark	21
U.S.	16

Agricultural research has benefitted humans in many ways. Researchers at the University of Missouri Agriculture Experiment Station discovered Aureomycin which led to the use of antibiotics for human health. In Wisconsin, agricultural researchers discovered vitamin A while searching for better cattle feeds. This discovery enabled doctors to treat scurvy and rickets which were found to be caused by a deficiency of vitamin A.

Research on animal tuberculosis eventually led to the development of a vaccine to prevent tuberculosis in humans. Agricultural research breakthroughs have helped solve many human health and nutrition problems.

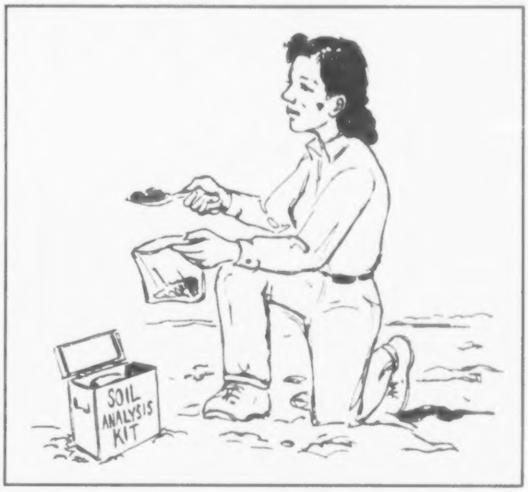
Agricultural Differences in America

Food crops and animals are produced in every state. However, different areas produce different crops and animals. Many factors influence where agricultural products are produced. Environmental conditions for optimum crop or animal production vary widely. Fortunately, environmental characteristics in the U.S. are also varied. As a result, agricultural production is concentrated in areas with favorable environmental conditions.

Soil conditions such as topography and fertility affect what crops can be grown. The length of the growing season is also important in the production of agricultural products. Many crops produced in the southern U.S. would not survive the harsh winters of the north. Animal production is concentrated in various regions throughout the U.S. Generally, livestock production is located in areas where feedstuffs are available.

Water is needed to produce agricultural crops. Areas that receive limited rainfall must use irrigation to produce agricultural crops. Temperature extremes in summer and winter months may also limit the crops or livestock that can be produced in some areas.

Figure 1.1 - Testing Soil Fertility



American Agriculture and the World

U.S. farmers produce enough to feed the U.S. population and for export to several foreign countries. Some countries with large populations or limited natural resources do not produce enough to feed their people. Although the U.S. is not the only supplier of food and fiber products in the world, many countries purchase U.S. products.

Excess production in the U.S. is exported to other countries. Large amounts of beef, poultry, pork, lamb, and other animal products as well as grains are exported annually. In 1989, the U.S. exported the following products to other countries. Grain exports are measured in Million Metric Tons (MMT). A metric ton is 2,200 lbs. One railroad car holds about 110 metric tons. Therefore, the amount of wheat exported in 1989 was about equal to a train with 343,154 cars.

1. Wheat - 37.747 MMT
2. Coarse grains (corn, oats, barley, rye, sorghum) - 60.448 MMT
3. Rice - 3.048 MMT
4. Soybeans - 14.115 MMT

Some of the areas of the world that import food from the U.S. are:

1. Western Europe
2. Eastern Europe
3. USSR
4. Asia - Japan, China, Taiwan, South Korea, Pakistan, Philippines
5. Middle East - Iraq, Saudi Arabia
6. Africa - North Africa, Egypt, Algeria, Sub-Saharan Africa
7. Latin America - Mexico, Brazil, Venezuela
8. Canada
9. Oceania

Summary

Agriculture in America is more complex than just producing food and fiber products for U.S. consumers. Agriculture provides benefits such as jobs, research, income, and discoveries that increase the quality of human life. Many human diseases have been controlled as a result of agricultural research. Agriculture benefits everyone each and every day.

Lesson 2:

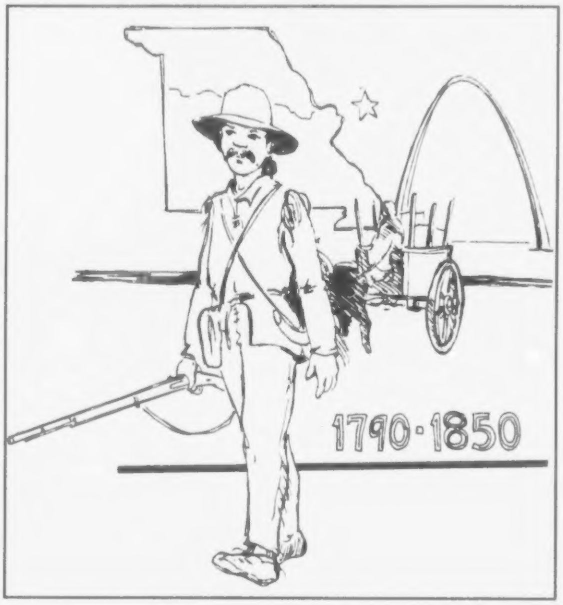
Development of Agriculture in America

Before the American Revolution, American colonies were becoming self-sufficient. Colonists were increasing their ability to produce food. In this lesson, the development of America will be discussed and how agriculture helped to develop this country.

A Developing Nation

Food is the most basic human need. Without food, people cannot survive. Shortages of food and fiber products have been a problem throughout the history of the world. In many areas, food shortages have become a way of life.

Figure 2.1 - "Gateway to the West"



The ability to produce their own food grew to the point where the American colonies were exporting products to England by the 1770s. Between 1790 and 1850 many people from the east moved into the western part of the U.S. Westward expansion opened up new lands and opportunities. Large areas of land were claimed by farmers and ranchers. Food production increased rapidly. New cities and towns were established. Many people started businesses in cities and towns as the U.S. expanded westward.

St. Louis, Missouri, became the starting point for many westward travelers. The city became known as the "Gateway to the West." Both St. Louis and Kansas City became very important business centers as the U.S. expanded to the west.

The establishment of cities, farms, and ranches in the west required many supplies. Food, clothing, hardware, and other items were shipped by wagon trains or boats where it was possible. On May 10, 1869, the tracks of the Union Pacific railroad from the east and the Central Pacific railroad from the west were joined near Salt Lake City, Utah. The transcontinental railroad carried people, food, supplies, and agricultural products across the nation in a matter of days. The growth and development of the U.S. was aided by the ability of farmers and ranchers to produce agricultural products. Products included food, fiber crops for clothing, and materials for shelter. Because of the efficiency of agricultural production in the U.S., many citizens were able to pursue other careers.

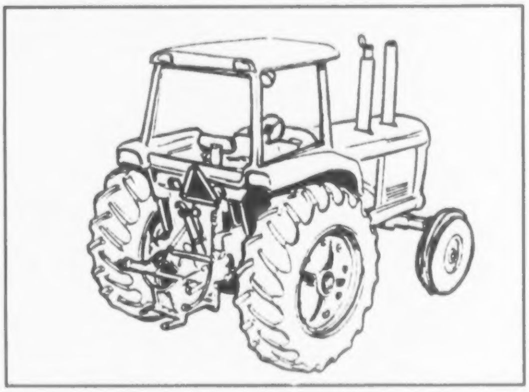
Advancements in Agriculture

As the U.S. grew, agriculture contributed to its growth. Inventions such as steel plows made working the soil much easier. New crops were introduced from other countries. Research on crops was being conducted by progressive individuals. Crop rotation systems and commercial fertilizers were used to improve crop yields.

Inventions such as the cotton gin (1793) and the mechanical reaper (1833) enabled American farmers to increase agricultural production. In 1862, the U.S. Congress passed the Morrill Act. This act granted land in each state to establish "Land Grant Colleges" to teach agriculture and mechanical arts. The University of Missouri-Columbia was developed as a land grant college.

Sanborn Field on the University of Missouri-Columbia campus is the oldest Agricultural Experiment Station west of the Mississippi River. Aureomycin, an antibiotic used in disease control, was discovered on Sanborn Field.

Figure 2.2 - Tractor



Many other advancements have been used in agriculture. Commercial fertilizers were first used in 1849. The invention of the mechanical cotton picker in 1927 eliminated the need for hand picking. Gasoline tractors replaced horses in supplying farm power. These advancements enabled agriculture to supply the food and fiber needs of a growing U.S. population. As the population increased, the demand for agricultural products grew likewise. American agriculture continues to meet those needs.

Benefits to American Citizens

The growth of the U.S. was possible because of the ability of farmers to provide food, clothing, and shelter for themselves and others. Because of the abundance of food and other agricultural products, grocery shelves are full of low-cost, nutritious foods. Modern production, transportation, and storage methods have enabled consumers to purchase quality food at a low cost. Specifically, advancements in storage have enabled consumers to purchase perishable foods throughout the year.

As a result of the abundant quantities of food, Americans spend less on food than people in any other country. Money not spent on food can be used to purchase other items. Having extra money to spend increases the demand for other products and services. The increased demand for other products and services, in turn creates jobs for more people.

Research in agriculture benefits individual citizens. Information about health and nutrition is available as a result of agricultural research. Several medical discoveries have been made as a result of agricultural research.

Figure 2.3 - Research in Agriculture

RESEARCH TOPIC

There are many jobs related to the production, processing, grading, shipping, storing, marketing, and exporting of agricultural products. Many people do not realize the number and variety of jobs that are related to agriculture.

Government Programs

The United States Department of Agriculture employs many people throughout the U.S. The USDA sponsors programs to ensure a safe supply of food. The Food Stamp Program provides coupons to enable needy persons to purchase food. Some food products are distributed free of charge or at a reduced price to needy persons through surplus commodity distribution programs. The WIC (Women, Infants, and Children) Program is designed to improve the nutrition of expectant mothers and young children. The School Lunch Program is designed to ensure school-aged children receive a good meal each school day. All of these programs are supported by the USDA.

Summary

The development of the U.S. can be directly traced to improvements in agriculture. Efficient agricultural production has enabled many people to pursue other careers. Agricultural research has also contributed to human health and nutrition. Government agriculture programs have also been developed to supply quality food to needy people. The U.S. is a leader in world food production. Much of the food produced in the U.S. is exported to other countries.

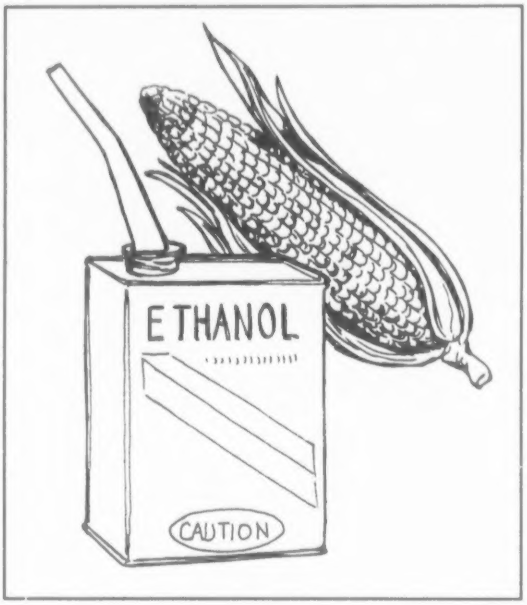
Lesson 3:
Agriculture in the Future

Agriculture and agricultural research have improved the quality of life in the U.S. The abundance of quality food products, healthier diets, and low-cost food products are the result of a progressive agricultural industry. This lesson is about recent advances in technology and future changes expected in agriculture.

Future Changes

Agricultural technology has changed from the use of hand tools to computer-monitored, electronic equipment. The use of computers and electronic monitors is likely to increase. Equipment used in production and harvesting is more efficient. Similar changes have also occurred in the production of farm animals. In the future, agriculture is expected to increase production of crops for alternative uses. Dwindling fuel supplies require that production of renewable energy sources be increased, such as producing ethanol. World trade of agricultural products is also expected to increase with many former communist countries in the future.

Figure 3.1 - Ethanol from Corn



Scientific changes are also expected in agriculture. Advances in production of pest-resistant plants will reduce the need for chemical pesticides in the future. Animal production will also become more efficient as a result of scientific advances in production and breeding.

Recent Advancements

Biotechnology has had a positive impact on agriculture. Biotechnology involves combining the work of basic sciences such as biology, chemistry, and genetics. The goal of biotechnology is to produce plants and animals that would not occur naturally. Biotechnology may sound like science fiction, but the research and discoveries are very real and beneficial.

Research to produce genetic changes in plants and animals is being conducted. Research in biotechnology is conducted to reduce production costs and increase food production. Some crops, such as soybeans, have the ability to utilize nitrogen from air in the soil for fertilizer. Researchers are attempting to alter corn plants to enable them to utilize nitrogen from the air too. If successful, such technology would reduce the use of commercial fertilizers. Thus reducing the cost of production.

Several mechanical advances have been made that are important in agriculture. The use of electronic-monitoring devices, hydraulics, lasers, and robotics are most notable. Each of these technologies are being used in various phases of agriculture. The technology is being used to reduce human labor costs. Reducing the cost of labor required to produce, process, market, and transport food and fiber products will significantly reduce the cost of production.

Figure 3.2 - Computers Used for Analysis

PRODUCTION
MANAGEMENT
ANALYSIS
SOFTWARE

Another technological advancement is Integrated Pest Management (IPM). IPM is a complex system of cultural, biological, and chemical methods to control pests (weeds, insects, and diseases) in crops. Using IPM practices will reduce the use of chemical pesticides in crop production.

Future Goals of Agriculture

The future goals of agriculture are not expected to change much from the present. Agriculture will continue to produce food and fiber products for a growing world population. Agriculture will also increase the production of crops that can be used to supply energy. Crops with a high energy value are needed to reduce the dependance on oil, coal, and natural gas.

Summary

The future of agriculture in America is very bright. The fundamental goal will be to continue to produce quality food and fiber for the U.S. and the world. The demand for food, fiber, and energy is expected to increase. This has prompted researchers to investigate ways to increase agricultural productivity. A growing world demand is one factor that will propel American agriculture into the future.

Lesson 4:
U.S. Agriculture in the World

This lesson is about the role of the U.S. in the world food situation. The U.S. has taken steps to help other countries grow the food needed to feed themselves. The U.S. is one of eight countries that exports agricultural products to other countries. The U.S. also provides other kinds of aid to countries in need.

Agriculture and the World Economy

Agriculture is an important industry in the world economy. At the most basic level, agriculture produces the food, clothing, and shelter that the world population needs for survival. However, some countries cannot produce the food needed to feed their citizens. Other countries are fortunate to produce more than they need. Countries with a surplus, export food to countries that are short of food.

Countries that export agricultural products may use the income to buy other products on the world market. Some countries will buy goods that improve the quality of life for their citizens. Others will buy weapons and equipment to improve their military power.

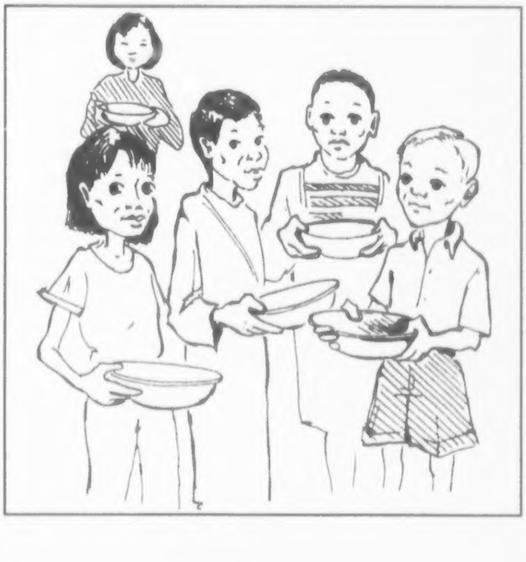
The U.S. exports large amounts of agricultural products to other countries. Agricultural exports generate billions of dollars of income for the U.S. Income derived from the sale of agricultural products enables the U.S. to buy crude oil and other goods to maintain a high standard of living in this country.

Foreign Aid

It is estimated that 85 percent of all births in the world occur in countries that are underdeveloped. Underdeveloped countries are not able to produce enough to feed their people. The U.S. is one of eight countries in the world that produces more agricultural products than it consumes. Therefore, the U.S. is able to provide surplus agricultural products to other countries.

The U.S. exports nearly one-third of its agricultural production to more than 50 foreign countries. The U.S. also contributes to disaster relief programs, which assist areas that have been hurt by floods, earthquakes, or droughts. In addition to export sales and disaster relief, the U.S. provides food to some countries at a reduced price or on credit. Providing food for free or at a reduced price is a form of foreign aid. Several countries owe the U.S. billions of dollars for food and other agricultural products that were sold on credit. The U.S. has often forgiven a portion of the debt owed as a humanitarian gesture or as part of a political negotiation.

Figure 4.1 - U.S. Provides Food



In addition to providing food and agricultural products to other countries, the U.S. exports technology. Many countries have the ability to produce adequate amounts of food. However, due to poor storage and marketing practices, over half of the production may be destroyed before it can be consumed. U.S. consultants, have assisted several countries by improving their food production and storage techniques. Several countries have also entered into contracts with U.S. colleges and universities to improve agricultural practices. The use of new practices would enable many countries to become self-sufficient and less reliant on purchasing food on the world market.

The Future for U.S. Agriculture

The Population Reference Bureau projects that the world population will increase from 4.4 billion people in the 1980s to over 6.2 billion by the year 2000. A nearly 50 percent increase in the population will require similar increases in food production. The increased demand for food will require the U.S. and other countries to increase the production of food.

Several countries in the world have begun to experience the benefits of industrialization. Citizens of many developing countries have taken steps to improve their diets. Some countries depend on rice or wheat products as the main part of their diets. Developed countries have a greater portion of their diet consisting of meat and other high protein foods. As a country achieves higher levels of development, the diet of the people usually improves.

The quantity of food produced in a country may vary widely from year to year. The supply of food that is produced depends on several factors. Many countries suffer from poor growing conditions. Such conditions may be caused by weather or other natural disasters. These conditions may prevent a country from producing enough for themselves or for international trade. Government policies, transportation and storage facilities, and technological advances also influence the supply of food in a country each year.

Summary

The demand for food and other agricultural products is increasing. Agriculture in the U.S. will continue to provide food, clothing, and shelter for an expanding world population. The U.S. will also play a key role in providing assistance to countries that cannot produce the food needed for their citizens. Such programs will involve providing technical and educational assistance to developing countries. Although the demand for food is expected to increase, the supply will continue to vary as a result of several factors.

Lesson 5:
Agriculture in Missouri

Missouri is a diverse state. The geography, vegetation, climate, and soil fertility vary widely. As a result, agricultural production varies in a similar manner. This lesson will review the importance of agriculture to Missouri, the diversity of the agricultural industry, and the future of agriculture in the state.

Missouri Agriculture

Missouri farmers grow a wide variety of agricultural products. Crops and livestock produced in Missouri include: cattle, hogs, sheep, cotton, corn, beans, wheat, tobacco, milo, apples, grapes, cheese, hay, milk, chickens, rice, turkeys, honey, and sorghum. In 1989, Missouri farmers produced over $4 billion of agricultural products. Over $1.2 billion of Missouri agricultural products is exported to foreign countries.

There were 108,000 farms in Missouri in 1989. The industry of agriculture employs more people in the state than any other industry. Missouri agriculture offers many opportunities for employment throughout the state.

Table 5.1 - Missouri's Ranking

Beef cattle and calves	-	2nd
Hay	-	2nd
Winter wheat	-	4th
Grain sorghum (milo)	-	4th
Turkeys	-	5th
Hogs and pigs	-	6th
Soybeans	-	6th
Rice	-	6th
Concord grapes	-	6th
American cheese	-	7th
Corn	-	9th
Butter	-	9th
Cotton	-	10th
Milk	-	11th
Eggs	-	13th
Red meat	-	13th
Chickens	-	14th

Missouri's Ranking

Missouri is a major producer in the U.S. and ranks high in the production of several agricultural commodities. Table 5.1 lists Missouri's ranking for agricultural products. The number of beef cows and calves produced ranks second only to Texas. The abundance of pasture land in Missouri provides an ideal environment for cattle grazing. Other states with more grain production will buy feeder calves to raise in feed lots on a grain ration until they reach market weight.

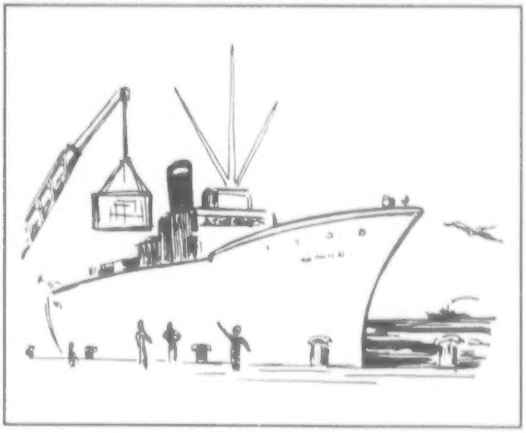
Missouri is also the second ranking state in hay production. Hay is an important feed for cattle and calves during the winter months when pastures are dormant.

Missouri's Future

Agriculture in Missouri has changed dramatically over the past few years. Significant changes are also expected in the future. Over the next few years the number of farmers is expected to decline. The average size of farms is expected to increase. There will continue to be a large number of small farms and hobby farms involved in agricultural production. However, mediumsized, family farm operations are expected to decrease in number.

Other changes expected to occur in Missouri agriculture include the development of new crops as feed, food, or energy sources. Also, larger amounts of Missouri products will be exported to other countries. As a result, total cash receipts from agricultural production should increase.

Figure 5.1 - U.S. Exports Farm Products



Agricultural producers will also adapt production practices which reduce the impact on the environment. Special attention will be directed toward practices that conserve soil and maintain quality water supplies. Livestock producers will continue to demonstrate humane treatment of the animals they produce. Special interest groups will likely become more vocal. Some radical factions may call for a halt to animal agriculture in the U.S.

Summary

Agriculture is the most important industry in the state of Missouri. Agricultural production directly contributes to the state's economy through domestic consumption and international export. Missouri is one of the top ranking states in terms of agricultural production. Several changes in agriculture are expected in the future. It is expected that there will be fewer, but larger farms. Farms in the future are expected to produce new crops and generate higher incomes than in the past.

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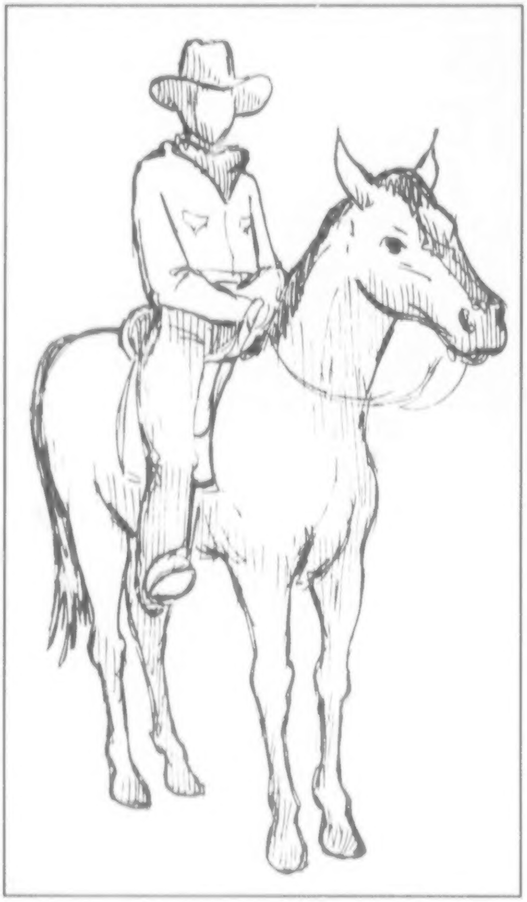
Lesson 1:
Importance of Animals

For thousands of years, animals have served people. The variety of goods and services provided by animals continues today. Throughout the world, animals are important to people.

Services and Products of Animals

Early in history, animals provided many services. Animals were used for food, clothing, and transportation. When large soil cultivation tools were invented, animals were used to pull these tools. Increased food production was possible when animal strength was harnessed.

Figure 1.1 - Animals Provided Transportation



The date of animal domestication is not known. People did not realize the long-term effects when they began to tame wild animals. However, the taming of wild animals has produced many benefits. Over time, animals have become even more important to humans.

Planned production of animals increased the production of food and other products. Food for humans and other animals is produced from animal products. Cattle, swine, sheep, and poultry continue to supply food for people in the U.S. and around the world.

Transportation was also easier with animal power. Although the U.S. uses gas-powered equipment in agriculture, many developing countries still rely on animal power. Beasts of burden, animals that provide a source of power, would include oxen and horses.

Medical research on animal diets, nutrition, and disease continues to benefit humans and other animals. Research with laboratory animals is vital for future medical advances. Many medicines used in human health can be traced to animal sources.

Some animals provide specialized services for people. Seeing eye dogs aid the blind to move about in the world. Many animals are used as pets and provide companionship as their only service.

Why Animals Are Treated Differently

The treatment of animals varies with the type of animal and the service or purpose it provides. All animals need food and shelter. However, not all animals have the same eating habits or need the same kind of shelter. Each species has unique needs. However, all animals should be treated humanely.

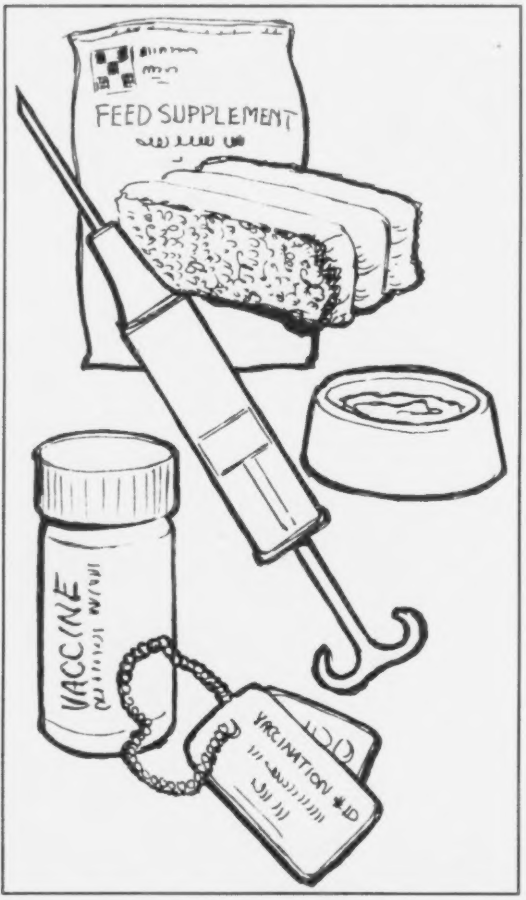
Owners should be aware of their animals' needs. Farmers and ranchers spend many hours caring for their animals. Sick or diseased animals cost more to produce. Therefore, farmers and ranchers have an incentive to treat their animals well.

Care of Animals

All animals require proper food, water, and shelter. Animal differences need to be considered when making decisions about their care. The size and number of animals dictate the amount of space required to avoid overcrowding. Too many animals in a small area can promote sickness or injury.

Preventative medical care and treatment should be provided to avoid health problems. This includes vaccinations and check-ups. Accurate records should be kept on each animal to keep track of routine or emergency medical care provided. Animals need daily attention to prevent medical problems and injuries.

Figure 1.2 - Animals Need Food and Medical Care



When transporting animals, avoid overcrowding and lengthy trips without rest stops. Animals get stressed and have to rest. When working with animals like hogs, cattle, or sheep, avoid the use of clubs, canes, or sticks to prod them.

Pets should be trained to avoid accidents in the house. Have realistic goals and expectations for pets. Don't leave animals unattended for extended periods of time. Try to be considerate of other people when exercising pets. Remember, pets require a lot of attention and love. Be sure to provide both.

Summary

Animals provide many vital products and services for humans. Animals are no longer used as a primary source of power. However, the food and services they provide are important. Providing adequate care for animals is an important responsibility.

Lesson 2:
Animal Ownership

Animals do not have the ability to reason as humans do. Therefore, animal control must be directed by humans. This lesson is about the need for animal control regulations and the responsibility that people have for their animals. Owners are responsible for the care, treatment, and behavior of their animals. Since biblical times, humans have had dominion (control) over animals.

Animal Welfare

The term "animal welfare" has a variety of meanings. To members of animal rights organizations, the term "animal welfare" often means providing "human" rights to animals. They believe that animals should be allowed social interaction as humans do. Other individuals define "animal welfare" to mean the elimination of all methods of animal production for food. Most individuals that hold this view are vegetarians and believe that no one should eat animal products.

Still there are other views of the term "animal welfare." To producers of food, it means providing humane care for animals. Mismanagement or improper care and treatment would mean endangering the animal or the entire operation because of disease or loss of income. Farmers and ranchers spend many hours providing for the needs of their animals to prevent sickness, injury, or disease.

Considering the many views of the term "animal welfare," the definition most accepted is, "providing care for the well-being of an animal."

Control Regulations

Animal control regulations are designed to protect people from animals. Animals that are uncontrolled can destroy property or hurt people. Regulations have also been passed to control or prevent the spread of animal diseases, such as rabies. Vaccination programs help to prevent disease outbreaks that can spread to humans.

Laws

Animal welfare laws have been passed to ensure that animals receive humane care. Animals such as dogs, cats, horses, and cattle have basic needs of food, water, and shelter. The failure to supply those needs would constitute cruelty to animals. Owners are responsible to provide for their animal's needs. Animal welfare laws are designed to ensure that people assume the responsibilities of animal ownership. In a sense, the laws protect the animals from people. These laws ensure proper and humane care of animals.

Animal Owner Responsibilities

Owners must provide the proper quantity and quality of food to meet the needs of their animals. Fresh food and water are daily requirements. Although veterinarians are animal health professionals, animal owners are also responsible for providing a reasonable standard of health care. Many animals need frequent exercise to maintain good health. Owners need to provide the time and space for animals to get proper amounts of exercise.

Summary

People have the ability to think, reason, and make decisions. Because of this ability, people have the responsibility to care for the animals of this world. Animal control regulations provide guidelines for the proper care of animals. Animal owners should provide adequate food, shelter, health care, and exercise.

Lesson 3:
Regulations Governing Animal Control

In previous lessons, the importance of animals to humans and the need for animal control regulations were discussed. These regulations affect the care and control of animals. Regulations governing animal control at local and state levels will be presented in this lesson.

Animal Laws

Animal welfare laws are designed to protect both animals and people. Some laws prescribe a level of care for animals. Among the provisions of animal laws are guidelines for:

1. Animal identification
2. Care and treatment
3. Registration
4. Transportation and handling
5. Laboratory use
6. Disease prevention

Animal identification is important to avoid ownership disputes. Registration is required by breed associations to certify the pedigree of animals used for breeding purposes. A pedigree is a list of the ancestors of a purebred animal.

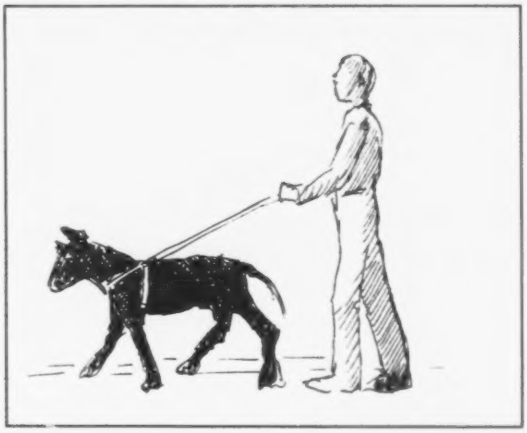
Transportation guidelines regulate minimum space requirements when moving animals. Guidelines for the maximum time that animals can be transported between rest periods are also specified. These laws are designed to avoid stress and injury to animals during transportation.

Animal welfare laws also contain guidelines for the treatment of laboratory animals. Research laboratories take their responsibility toward animals seriously. Much time and money is spent to conduct research with animals. Care is taken in feeding, watering, and sheltering these animals. Animal welfare laws set guidelines for research laboratories that use animals.

Local Regulations

Most cities have established laws or ordinances about the treatment of animals and the responsibilities of animal owners. These ordinances provide guidelines to prevent problems before they happen.

Figure 3.1 - Leash Laws



Examples of local ordinances are leash laws, vaccination programs, noise ordinances, and animal abuse ordinances. Animals allowed to run wild can jeopardize the safety of children and adults. Therefore, leash laws have been passed to keep dogs from running wild. Vaccination programs were developed to prevent outbreaks of diseases like rabies. Noise ordinances are designed to prevent dogs or other animals from barking and disturbing neighbors. Local ordinances are usually established to ensure that owners have control and responsibility for their animals.

State Regulations

Each state establishes regulations to protect the residents and animals in the state. Many states do not allow sick or diseased animals to cross state lines. These regulations are enforced to prevent the spread of diseases to healthy animals within a state.

The State Department of Conservation has fishing laws and hunting seasons to control animal populations. Uncontrolled wildlife populations may contribute to the spread of diseases or starvation. Excess hunting and fishing can reduce wildlife populations to unacceptable levels. The role of the Department of Conservation is important to insure abundant and healthy wildlife populations.

Certain diseases can be transferred from one animal to another and one herd to another. Some diseases can also be transmitted to humans. Brucellosis is an example of one of those diseases. Laws have been established to protect people from diseased animals.

Summary

Regulations governing animal treatment and control provide guidelines for the humane treatment of animals. Local animal control ordinances are designed to protect people and property from animals. State regulations govern the humane treatment of animals. Animal owners are responsible for the care, treatment, and control of their animals.

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Lesson 1:
How Horticulture Affects Our Lives

Importance of Plants

Plants are essential to the survival of human beings. Plants provide biological, physical and emotional benefits. Biological effects include the ability of the plant to convert carbon dioxide to oxygen through the process of photosynthesis. Photosynthesis also reduces carbon dioxide levels in the air. Plants are also the basis for the human food supply. People eat plants and animals that have eaten plants.

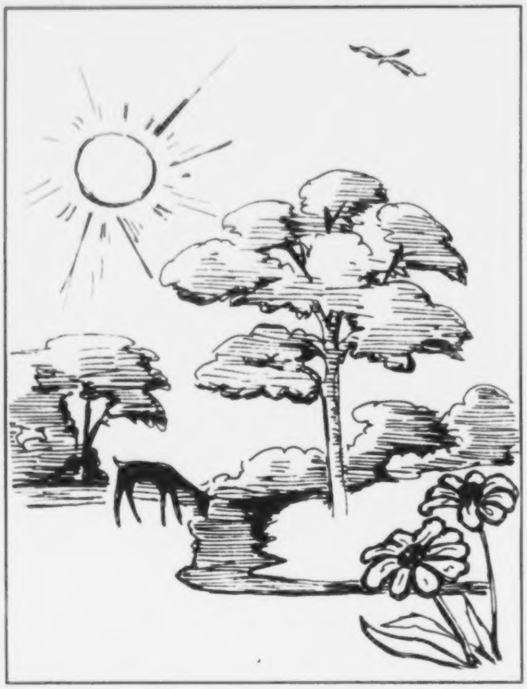
Plants also provide many physical benefits. Trees provide materials that are used to build shelters. Fibers such as cotton, used in making clothing, can be manufactured from plants. Plants can also supply shade, control wind, and provide cooling effects. Control of these climatic factors can aid in reducing both wind and water erosion. Energy sources, such as firewood or alcohol-fuels can be made from plant materials. Plants also provide a habitat for wildlife.

Emotional benefits include the beauty of well-landscaped areas as well as the enjoyment of interesting individual plants. Many Americans receive enjoyment from gardening and growing plants. Plants also provide a way to reduce stress, by the relaxing effect of gardening and tending flowers.

Horticulture

The study, production, and cultivation of plants is divided into four broad fields: horticulture, botany, agronomy, and forestry. Horticulture is the production and marketing of fruits, vegetables, and ornamental plants. Fruits include applies, pears, blueberries, peaches, and plums. There are many kinds of vegetables including peas, corn, tomatoes, beans, and cucumbers. Ornamental plants are plants grown for their beauty or usefulness, such as flowers, houseplants, trees, shrubs, turfgrass, Christmas trees, ground covers, ornamental grasses, and ferns.

Figure 1.1 - Plants Add Beauty to the Environment



Related Fields

Three areas of science are closely related to horticulture. These areas all study plants for different reasons. Botany is the study of plants in their natural environment. Agronomy involves the large scale production of plants for grain, forage, or fiber. Farmers produce these crops on small farms or large farms. Forestry is concerned with the growing of trees for lumber, paper, and the natural beauty of forests. The United States has forest lands owned by individuals, companies and the government.

Careers in Horticulture

Many careers are available in horticulture. Some career areas include: fruit and vegetable production, processing, and marketing; floral design; greenhouse production; nurseries and tree farms; interior landscaping; landscaping; golf course maintenance; and lawn care.

Some jobs can be obtained with vocational training from a high school. These jobs might include work at a nursery, garden center, greenhouse, orchard, or golf course. Some careers require special training from a vocational school or a career training school. These careers include florists, landscape maintenance or installation crew foreman, tree pruner, or greenhouse grower. A college eduction is usually required for careers such as a greenhouse manager, landscape designer, golf course superintendent, or a garden center manager.

Summary

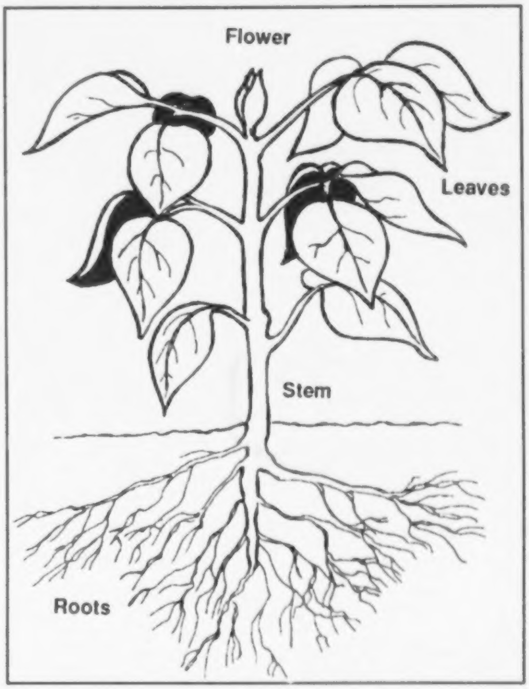
Plants are essential for providing people with oxygen and food. They also provide shelter, clothing, shade, and beauty. Horticulture is the production of fruits, vegetables, and ornamental plants. Horticulture, botany, agronomy, and forestry are all related plant sciences. Horticulture and these other plant sciences offer a wide variety of career opportunities. Training for these careers ranges from high school to advanced college degrees.

Lesson 2:
Plant Growth and Reproduction

Main Parts of a Plant

Plants are made of four main parts: leaves, roots, stems, and flowers. See Figure 2.1. Each of the major parts is essential to the growth or reproduction of the plant. Leaves are the location of food production for the plant. This production is through the process of photosynthesis. Respiration and transpiration also occur in the leaves. Leaves also can be the food storage area, like in cabbage or lettuce. Roots absorb water and nutrients from the soil. Roots anchor the plant in the soil, allowing it to grow upright. Roots can also act as a food storage area, like in turnips, beets, or carrots.

Figure 2.1 - Main Parts of a Plant



The stem supports the plant as a whole, but it mainly supports leaves and flowers. Stems transport water and minerals from the roots to all parts of the plant. Stems transport manufactured food (simple sugars) to all parts of the plant. Stems can also be sites for photosynthesis and food storage.

The flower is the site of sexual propagation. This is where the fruits and seeds are formed. During propagation the flower attracts insects that help transfer pollen from flower to flower. Insects can be attracted by color, pleasant fragrances, and unpleasant odors.

Photosynthesis, Respiration, and Transpiration

Photosynthesis is a process that occurs in green parts of the plant, mainly in the leaves and stems. Green plants contain chlorophyll, which reacts with water, carbon dioxide, and sunlight to produce oxygen and simple sugars. These sugars are the food source for the plant. Respiration is the process of converting simple sugars made during photosynthesis into energy for the plant. Transpiration is the plant cooling process that releases water vapor. This process is similar to perspiration in humans.

Important Factors in Plant Growth

Several factors are important for plant growth: moisture, temperature, light, humidity, gases, soil, and nutrients. Moisture is essential to maintain the shape of plant cells and for use during photosynthesis. Water enables nutrients to be absorbed from the soil and transported throughout the plant. Water transports the manufactured food to all parts of the plant. Water is also needed for transpiration and respiration. Humidity, moisture in the air, helps to reduce transpiration. Humidity also reduces the drying effects on leaves.

Temperature is a major influence on plants survival in particular environments. Plants differ greatly in their tolerance of hot and cold temperatures. Extremes in temperature can cause slow growth, fruit or flower damage, or death of the plant. Temperature and light are related in their influence on plant growth. Sunny conditions create a warmer environment, while shady areas will be cooler. Plants need different levels of light intensity. Light is also needed in the photosynthesis process.

Gases are important in both respiration and photosynthesis. Oxygen is produced during photosynthesis and is used in respiration. Carbon dioxide is a product of respiration and is used in photosynthesis.

The soil should allow for infiltration and movement of water and air throughout the root zone. Soil provides support for the plant. Soil also stores nutrients for use by plants. There are sixteen essential nutrients for plant growth. Three of these nutrients are commonly applied as fertilizer: nitrogen, phosphorus, and potassium.

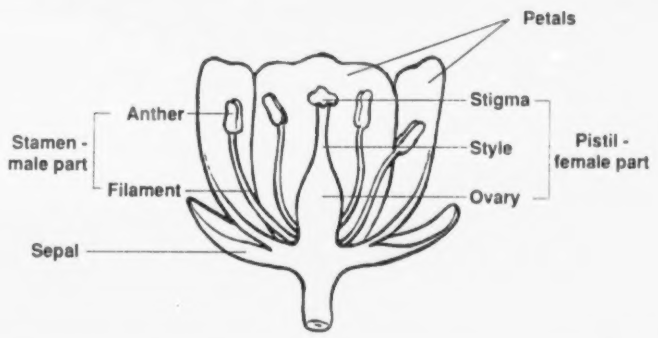
Plant Reproduction

Plants can be reproduced both sexually and asexually. Sexual propagation occurs within the flower, which produces fruit and seeds. Sexual propagation starts with the transfer of pollen from the anther to the stigma. This is called pollination. Asexual propagation produces new plants from vegetative parts. New plants of some species can be produced from leaves, stems, and roots using asexual methods.

Parts of the Flower

Flowers are the site of sexual propagation. Flowers have four main parts: the petal, the pistil, the sepal, and the stamen. The petal attracts insects for pollination. The pistil, which is the female structure of the flower, is the site of fruit and seed formation. The pistil is made up of the stigma, style, and the ovary. The sepal protects the flower in the bud stage. The stamen, which is the male structure of the flower, contains the filament and the anther. Pollen is produced in the stamen. Pollen is transferred by a variety of methods to the pistil. This transfer of pollen is called pollination.

Figure 2.2 - Parts of a Complete Flower



Asexual Propagation

There are seven common asexual propagation methods: cutting, grafting, division, layering, budding, tissue culture, and specialized plant structures. See Figure 2.3. Specialized plant structures are illustrated in Figure 2.4. Specialized plant structures include bulbs, corms, rhizomes, stolons (runners), and tubers. These specialized plant structures are all modified stems capable of producing new plants. Bulbs and corms multiply, producing new bulbs and corms each year. Rhizomes are stems that run underground to the side. They can produce new plants along the stem. Stolons (runners) are similar to rhizomes, but they are on top of the ground. Potatoes are an example of a tuber. The eyes on a potato are capable of producing new plants.

Summary

The four major parts of plants are important for plant survival or reproduction. Growth processes in these parts are influenced by water, humidity, temperature, light, gases, soil, and nutrients. Plants can be reproduced sexually using seeds or asexually using vegetative plant parts.

Figure 2.3 - Asexual Propagation Methods

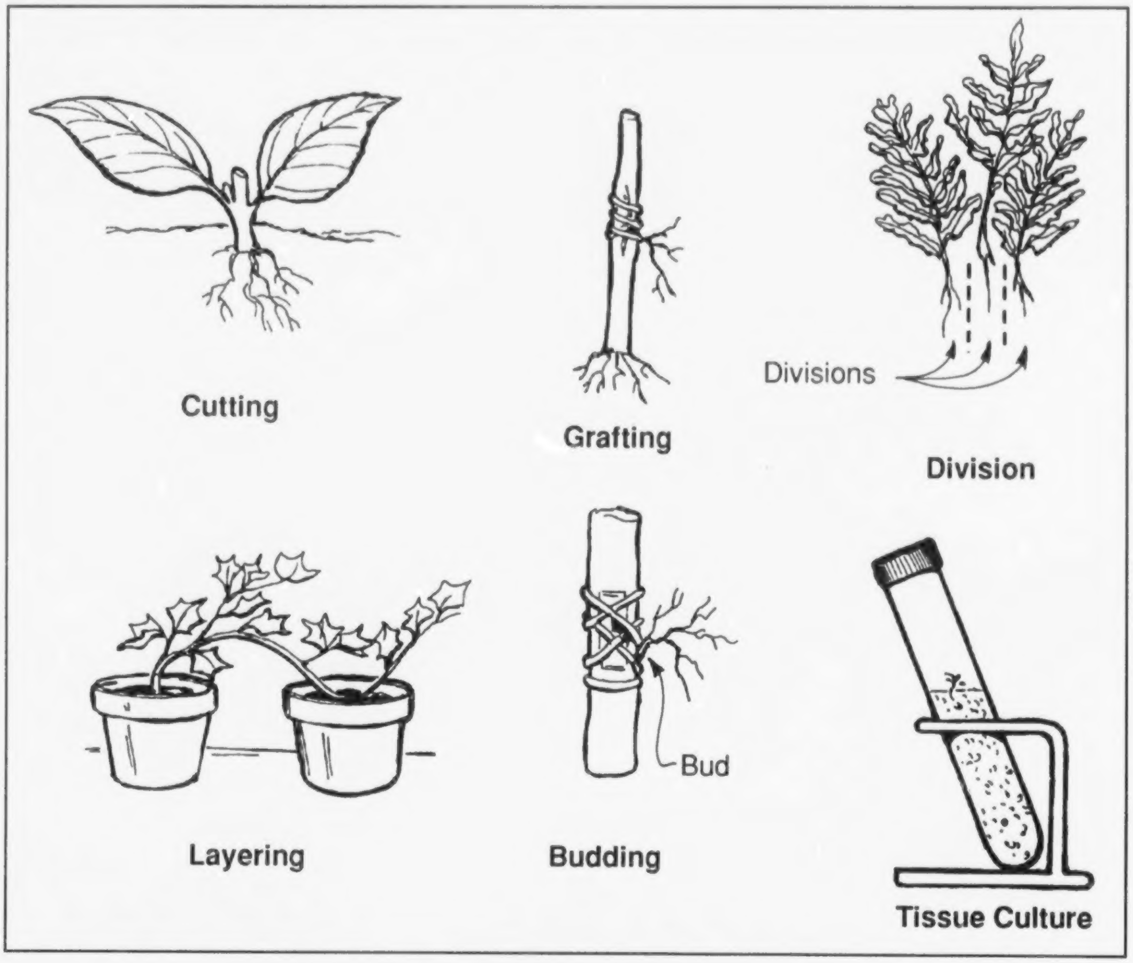
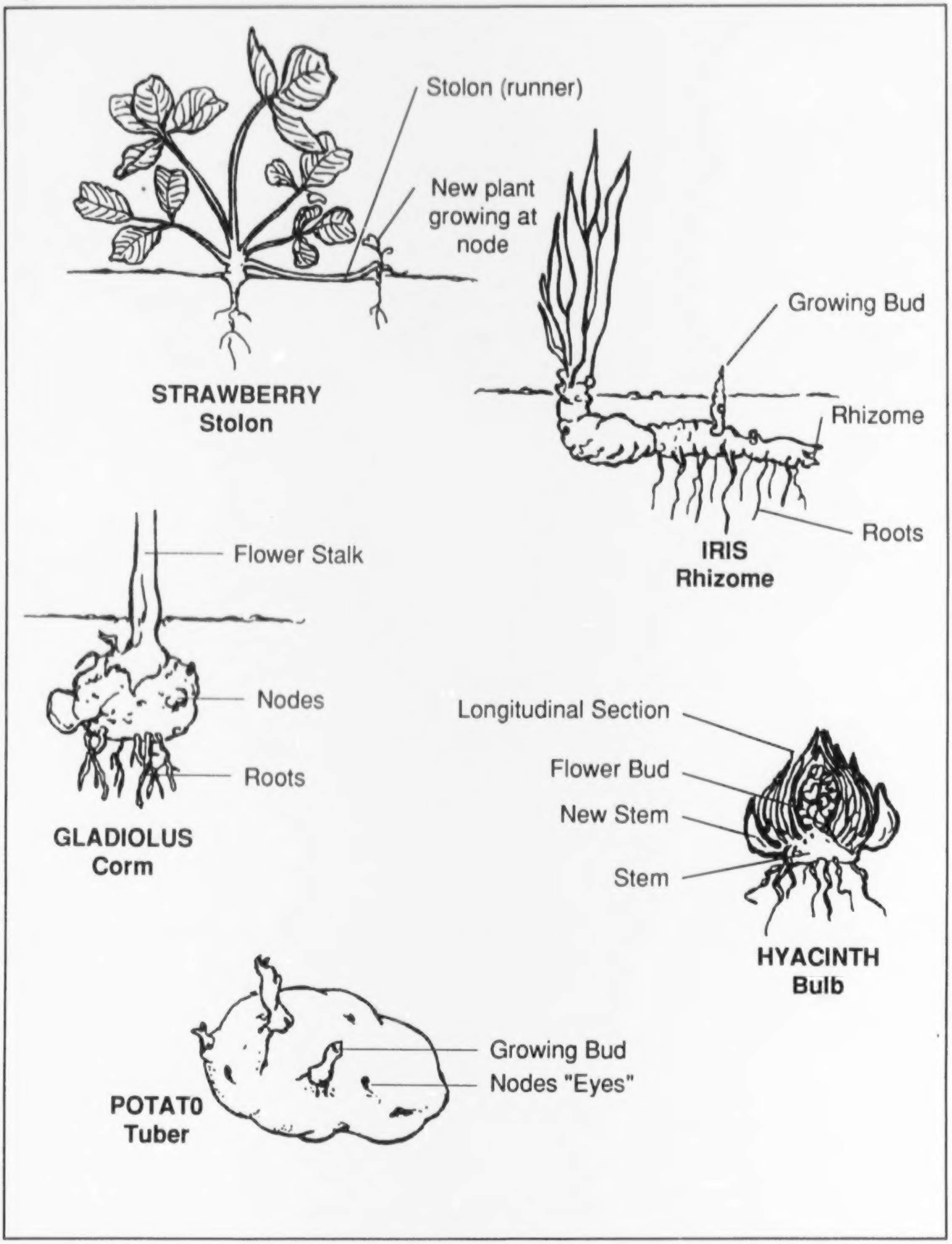


Figure 2.4 - Specialized Stems

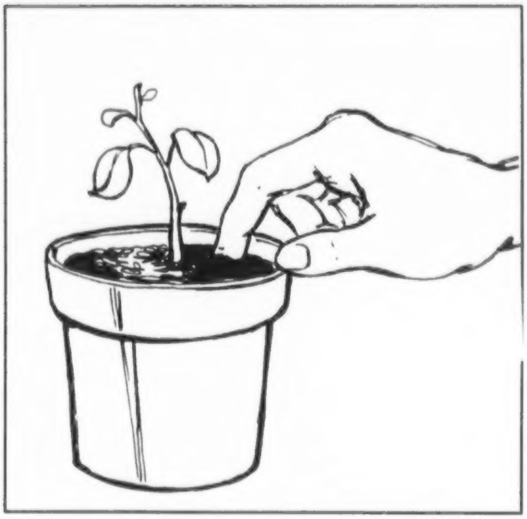

Stolon (runner)
New plant growing at node
STRAWBERRY
Stolon
Growing Bud
Rhizome
Roots
IRIS
Rhizome
Flower Stalk
Nodes
Roots
GLADIOLUS
Corm
Longitudinal Section
Flower Bud
New Stem
Stem
HYACINTH
Bulb
Growing Bud
Nodes "Eyes"
POTATO
Tuber

Lesson 3:
Caring for Plants

Important Factors to Consider in Plant Care

Several factors are important to consider when caring for plants. Plants vary greatly in their growth requirements. The best way to know how to care for a plant is to read about its needs in a gardening book. Water is an important requirement. Many plants die from either over or under watering. The general rule is to push your finger into the soil, if it is dry, water the plant thoroughly. This method does not work well for plants requiring moist or dry conditions.

Figure 3.1 - Testing for Moisture



Soil is another consideration in plant care. Soil requirements should be considered before planting. Once a houseplant is in the pot or an outdoor plant is in the ground, it is difficult to change the soil. Fertilizer can be used to change the nutritional level of the soil.

Plants have varying degrees of sensitivity to light. Some plants need full sun, while others need partial or full shade. Temperature needs vary along with light levels. High light areas tend to have higher temperatures. Humidity is also important for some plants. Higher humidity slows the amount of water lost from plant leaves.

Pest control is also an important consideration. One of the best ways to reduce pest problems is to keep the plant actively growing. A weakened plant is more susceptible to pests.

Care of Indoor Plants

Indoor plants require regular watering. The watering rate will depend on the type of plant, soil type, temperature, light, and humidity. Some plants require specific humidity levels for best growth. Indoor plants grow best when the temperature is around 70°F. They cannot tolerate extremely cold temperatures. Some indoor plants may have a problem of not getting enough light. This is usually due to the lack of good window space. Indoor and outdoor plants both require good soil; although, indoor plants are more reliant on being given good growing media. They require regular fertilization. Indoor plants should be pruned of dead or damaged leaves and branches as needed. Pruning is also done to improve the shape of plants.

Care of Outdoor Plants

Humidity is not easily controlled with outdoor plants. Outdoor plants usually require watering only during dry periods. Smaller plants such as turfgrasses, flowers, and vegetables may require more watering. Outdoor plants are heavily influenced by the climate. This is why plants should be selected for the climate. A plant that requires the temperature to remain above 32°F will not grow well in an area where the temperature drops below freezing.

Outdoor plants vary in their need for light or shade. Plants should be selected for the level of light available. Pollution can also be a problem with outdoor plants. Outdoor plants generally need only one fertilization per year. Turfgrasses, flowers, and vegetables are exceptions to the rule, needing several fertilizations during the year. Prune occasionally to remove dead and damaged leaves and branches. Also, prune to maintain the plant's natural shape, when it is needed.

Plants Can Have Several Pest Problems

Plants can have several different problems attack them. Weak plants are more subject to pests. These pests include insects, diseases, weeds, and other problems such as mammals (e.g., moles and rabbits) and birds. Plant problems are reduced by maintaining a healthy plant. If problems occur, they can be controlled with pesticides or biological methods.

Summary

Several important factors need to be considered in caring for plants. Plants differ in their need for these factors depending on the variety and location. The best way to know how to care for plants is to read their care guidelines in a gardening book. Keeping a plant in good health will reduce the possibility of having pest problems.

Lesson 4:

Fruit and Vegetable Gardening

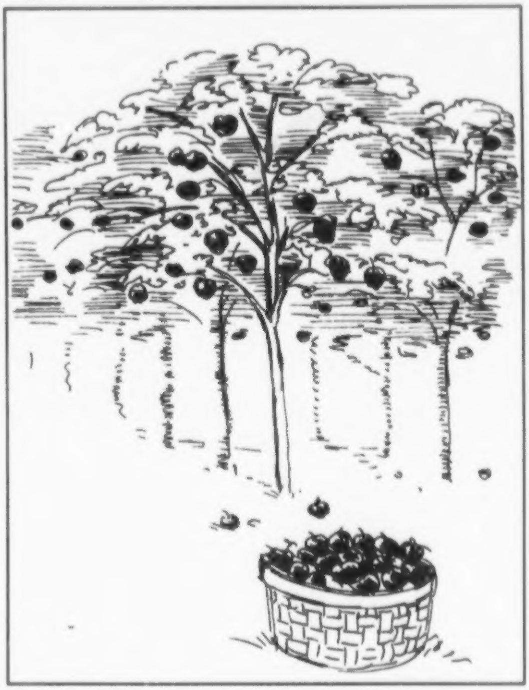
Growing Gardens and Orchards

People grow gardens and orchards for several reasons. Some people grow them to save money by reducing their grocery bill. Others want fresher produce or the chance to control the quality of produce. This is important for people desiring pesticide-free produce. The convenience of being able to pick fresh produce as you need it is also appealing. But probably the most popular reason is the enjoyment in gardening. Many people find gardening relaxing and gain a sense of pride from a job well done.

Commonly Grown Vegetables

Many different vegetables are grown in Missouri gardens. Cole crops are a family of early vegetables that include broccoli and cabbage. Greens such as lettuce and Swiss chard can grow early in the season. Root crops like carrots and radishes are also planted early. Some of the later crops include legumes like green beans and peas; vine crops like watermelons; squash; cucumbers; tomatoes; sweet corn; peppers; and asparagus.

Figure 4.1 - Apple Orchard



Commonly Grown Fruits

Many fruits are commonly grown in orchards and in home landscapes. Apples and pears both can be grown in Missouri. These two fruits grow on trees and have multiple seeds inside them. Peaches and apricots have one large seed inside. Cherries and plums also have one large seed. Grapes are becoming more common in the state due to the increased production for table use and wine. Other common fruits in Missouri include blackberries, raspberries, blueberries, strawberries, and gooseberries. Citrus fruits are common in the grocery store, but they must be grown in warmer regions, such as Florida and Texas.

Basic Steps in Planning a Garden

Before gardens or orchards are planted some planning needs to be done. Planning is essential to having a good garden with a minimum of unnecessary work. It is important to plan before starting the work or spending money on supplies. One of the most important things to consider is the location and size of the garden. Select a site handy to water, the compost pile, and the house. A garden far from the house will not be convenient for working. A good location for the garden or orchard will reduce labor throughout the year. The size of the garden is also important. Start small and let your garden grow with your interest. Also locate the garden away from shade.

When you know how much area you have for your garden or orchard, you can decide what to grow. Grow things that interest you. With these plants in mind, draw a garden plan of how the area will be planted. After you decide what to grow, purchase the seeds and plants from seed catalogs or garden stores. Next, prepare the soil by rototilling or spading. Plant the seeds according to the garden calendar.

Garden Tools

Very few tools are required to start gardening. Some of the basic tools needed include a hoe, rake, spade or spading fork, and something with which to water, such as a garden hose, watering can, or a bucket. A rototiller is also very handy for working in the garden. A string will also be helpful in setting out straight rows.

Organic Gardening

Organic gardening has become more popular in the last few years, with the increased concern over pesticide usage on vegetables and fruits. Organic gardening is the growing of plants without the use of chemical pest control. Biological pest control methods are used in their place. Using lady bugs to control aphids is one example of a biological pest control method. Generally petroleum based fertilizers are replaced with natural fertilizers such as manure, compost, and leaves.

Summary

There are many fruits and vegetables commonly grown in Missouri. These plants require some planning before they are grown. When planning a garden or orchard, decide what to grow, select the site, purchase seeds and plants, and start the work of gardening.

Credits

Care of Flowering Pot Plants in the Home. Champaign-Urbana, IL: University of Illinois, College of Agriculture.

Plant Structures and Function of Plant Parts. College Station, TX: Texas A & M University, 1986.

Reiley, Edward H.; Carrol L. Shry, Jr. Introductory Horticulture. 3rd ed. Albany, NY: Delmar Publishers, 1988.

Rice, Laura Williams; Robert P. Rice, Jr. Practical Horticulture. Englewood Cliffs, NJ: A Reston Book, Prentice-Hall, 1986.

University Extension agricultural guides: University of Missouri-Columbia

1. Caring for House Plants
2. Developing the Landscape Plan
3. Home Fruit Spray Schedule
4. Organic Gardening Techniques
5. Vegetable Harvest and Storage

U.S. Department of Agriculture, Environmental Protection Agency. Apply Pesticides Correctly. Washington, D.C.: U.S. Government Printing Office.

Vocational Agriculture Service. Handling and Using Pesticides. Urbana, IL: University of Illinois College of Agriculture.

Wilson, Jim; Tom Eltzrath. How to Grow a Thriving Vegetable Garden. Clearwater, FL: Countryside Books, 1984.

Lesson 1:
Agriculture in the Food Chain

Energy is required to sustain all forms of life on this planet. Life-forms can range from a single-celled organism to the most complex animal. This lesson discusses food chains and how people, through agriculture, have learned to control them to produce more food.

Nature's Food Chain

There are many food chains within the natural environment. The differences among food chains are brought about by environmental differences. Each environment is home to specific organisms. A food chain is a sequence of organisms in which each member of the chain feeds on the member below it. Also, each member is eaten by an organism above it.

A simple food chain occurring in the natural environment might begin with caterpillars eating leaves, grass, and stems. The caterpillars, in turn, are consumed by quail. Quail may be eaten by foxes. The sequence of one organism eating another happens continuously. Although quail eat caterpillars, they also feed on bugs and worms, so there are other organisms involved in this food chain.

There are also food chains in the aquatic environment. For example, algae are eaten by water insects, which in turn are eaten by minnows, which are eaten by larger fish. The larger fish may be caught and eaten by large herons or even predatory birds like eagles or ospreys. Humans may enter into this food chain by catching and eating fish. Waste products from higher life forms are in turn used by lower life forms to begin the process again.

The Food Chain and People

The world population can no longer survive with food available from the natural food chain. The population is simply too large. Many countries have learned how to produce large amounts of food. Agricultural production in these countries provides enough food for humans, for livestock, and for export to other countries. Countries that are not able to produce enough for the human population must purchase food from other countries.

Figure 1.1 - All People Depend on the Food Chain

In the agricultural food chain, the primary producers are plants. Food plants include crops like corn, wheat, barley, oats, and millet. Plants that produce vegetables and trees that produce fruits and nuts are considered primary producers. Crops such as grasses and forages used as livestock feed are also primary producers.

Some countries have the ability to produce enough to feed their human populations and their livestock. Food for humans can be obtained from both plant and animal sources. Nutritionally balanced diets for humans can be obtained when both plant and animal products are used. Unfortunately, many countries do not have enough to feed their human and animal populations adequately. This creates greater competition between humans and livestock for food crops. During periods of food shortages, livestock production is greatly decreased, and humans eat plant products of lower nutritional value.

Agriculture and the Food Chain

Throughout history, humans have used the natural food chain to obtain food. Eating berries and catching fish and larger game animals provided food for individuals and communities. Larger populations and the demand for more food prompted the controlled production of food. Agriculture and agricultural practices have enabled people to produce larger amounts of food than would be produced naturally in the food chain. Large-scale agricultural production has helped reduce food shortages in many parts of the world. Humans cannot survive only using food produced by the natural food chain.

Domestication of animals (used for power to cultivate crops) has changed the human dependency on the natural food chain. People have learned to manipulate the environment to increase food production. Today, American farmers produce more food than any other nation in the world. Although people have learned to manipulate the food chain, care must be taken to protect the environment and the natural food chain for wildlife.

Summary

Natural food chains occur throughout the world in every environment. Through agricultural research and technology, the ability to produce large amounts of quality food is possible. Continued work in agricultural research will expand agricultural production and increase the availability of food to all people. Agriculture manipulates the natural food chains in order to increase food production.

Lesson 2:
Food Groups

Balanced Diets

People must eat a variety of foods to obtain nutrients needed to keep their bodies healthy. Healthy bodies are better able to resist disease. Nutrients are also needed to help young people grow and develop into mature adults.

Four Major Food Groups

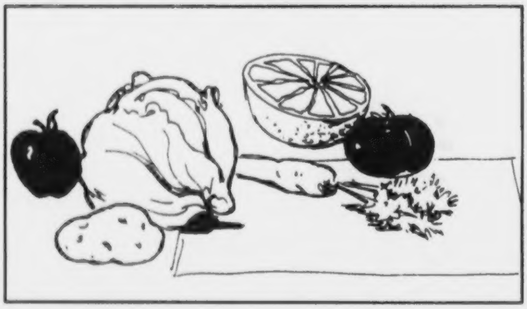
There are four major food groups. Foods are needed from each group to maintain health. The food groups are: (a) meat and meat alternatives, (b) fruits and vegetables, (c) grains, and (d) milk and milk products.

Nutrients From Each Group

Foods are classified into one of the four major food groups because of nutrients they contain. Foods in the meat and meat alternatives group are high in protein. Protein is essential for the growth and maintenance of muscles and internal organs.

Foods in the fruit and vegetable group are high in vitamins and fiber content. Vitamins are important to maintain health.

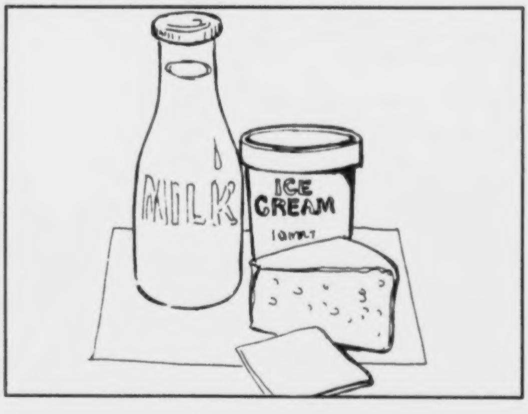
Figure 2.1 - Fruits and Vegetables



Grains are high in fiber and an excellent source of carbohydrates. Carbohydrates supply energy.

Milk and milk products contain vitamins, minerals, and protein. Milk products are especially high in calcium. Calcium is important for strong bones

Figure 2.2 - Milk and Milk Products



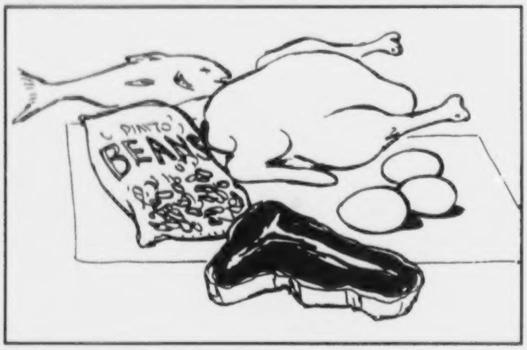
and teeth. Milk products also supply riboflavin and vitamin A.

Some foods and condiments (e.g., mustard and catsup) do not fit into any group. They compliment other foods but do not replace foods in any of the groups. Food that does not supply basic nutrients has often been labeled "junk food." Soda, cakes, cookies, and candies are examples of junk foods, which are generally high in sugar and low in nutritional value.

Food Group Examples

There are many foods in the meat and meat alternatives group. Beef, fish, lamb, pork, and poultry are good sources of protein. Eggs are also a good source of protein. Legumes such as soybeans, dried peas, and dried beans and nuts including peanut butter are also in this group.

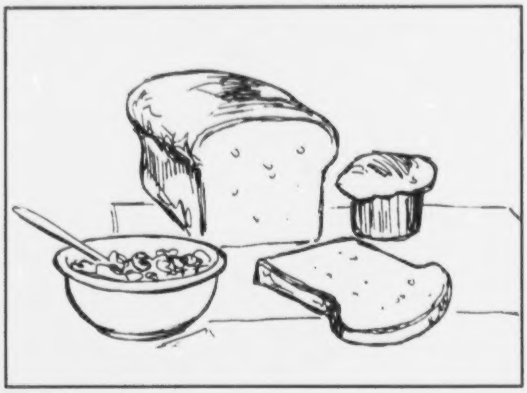
Figure 2.3 - Meat and Meat Alternatives



There are many kinds of fruits and vegetables. They include tree fruits such as apples, cherries, oranges, and peaches. Small fruits would include grapes, raspberries, and strawberries. Vegetables include vine crops like squash and cucumbers; root crops such as carrots, onions, radishes, and potatoes; and other vegetables such as okra, peppers, and broccoli.

Foods in the grain group include breads, rolls, muffins, and foods produced from grains. Breakfast cereals, noodles, pasta, and rice are all produced from grains.

Figure 2.4 - Foods in the Grain Group



Foods in the milk group include whole, skim, and evaporated milk. Milk products would also include ice cream, ice milk, cheese, cottage cheese, and yogurt.

There are many foods that lack significant nutritional value. They should be limited in the daily diet. Fats such as butter, margarine, and vegetable oil are sources of carbohydrates but lack other qualities.

Most beverages like coffee, soda, and tea have no nutritional value. Sugars and sweeteners such as sugar cane, beet sugar, Nutrasweet®, and Saccharin® provide empty calories with carbohydrates but no other needed nutrients. Herbs and spices are very important in cooking, but they do not provide nutritional benefits. Cakes, cookies, pies, and donuts are produced from grain flours, but they have little nutritional value.

Summary

The human body requires many nutrients to maintain good health. Foods from each of the four major food groups are essential to provide these nutrients. The four major food groups are meat and meat alternatives, fruits and vegetables, grains, and milk and milk products. Some foods lack significant nutritional value and need to be limited in the daily diet.

Lesson 3:
Food Products from Plants

Food Products from Grain

Plants supply a large portion of the food in the human diet. Some foods from plants can be eaten fresh. Grains usually require some form of processing before being eaten. Grain crops grown in Missouri include corn, milo, rice, soybeans, and wheat.

Flour is a food product processed from wheat grain. Flour is used to make bread and other pastries. Cold and hot cereals are processed from grains. Cooking oil can be processed from corn, soybeans, and sunflowers. Corn has become a major source of sweeteners. Pasta, including macaroni and noodles, is produced from wheat. Soybean products are used as a protein alternative to meat and may be added to many foods.

Starch processed from grain has many purposes. Dextrose is a corn product that can be used as a sweetener in human foods. Several snack foods are made from grains, including snack chips and crackers. Popcorn is a common snack food make from grain.

Food Products from Vegetables

Many types of vegetables are grown in the Midwest. Vegetables are usually grown in home gardens or on truck farms that grow produce. Vegetables are used in a variety of ways. Fresh vegetables can be eaten raw or cooked. They can be canned, frozen, juiced, or used in soups.

Food Products from Fruits

In the Midwest, many types of fruits are grown including apples, cherries, grapes, peaches, plums, raspberries, and strawberries. They can be grown in home plots or in commercial orchards. Fruits can be processed and consumed in the following forms: fresh, canned, frozen, dried, juiced, and in jams and jellies.

Figure 3.1 - Food Products from Fruits

FOOD FROM PLANTS

Food Products from Other Plants

Other plants are used to make food products such as maple syrup, herbs, chocolate, nuts, mustard, tea, coffee, and spices. Many of the plants that produce these products are not grown in Missouri. However, pecans are an important crop in the state.

Summary

Foods from plants make up a large portion of the human diet. Foods from grains, vegetables, fruits, and other plants may be eaten fresh or in a variety of processed forms.

Lesson 4:
Food Products from Animals

Food from Meat Animals

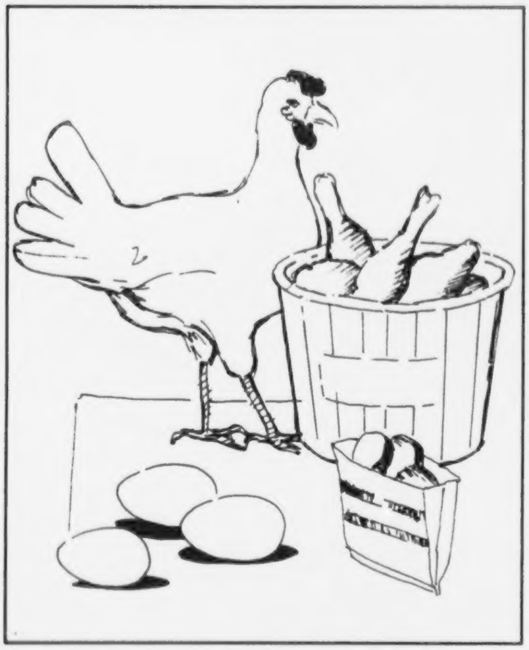
The quality of human diets is largely determined by the amount of meat that is consumed. Generally, the more beef, pork, and poultry that is eaten, the better the diet. Beef comes from cattle and is often eaten as hamburger, steak, and roast. Veal is produced from young cattle and is a very lean meat. Pork is produced from hogs. Common products from hogs include pork chops, ham, and bacon. Lamb meat comes from young sheep. Meat from sheep of more than one year of age is called mutton. Common cuts from sheep are lamb chops and leg of lamb. Rabbits are also produced for meat.

Processed meats often combine beef, pork, and poultry. Processed meats such as luncheon meats and hot dogs may be produced with only one type of meat or by blending beef, pork, and poultry together.

Foods from Poultry

Eggs are produced by several species of poultry. In most areas, only chicken eggs are eaten. Most chickens produce white eggs. However, some breeds of chickens produce brown eggs. Meat is also a major food product from poultry (chicken, turkey, duck, goose, etc.). Birds raised for egg production are usually not of the same breed as those produced for meat. Chicken and turkey have become more popular in recent years since they contain lower levels of fat than beef or pork. Mayonnaise is a product that is processed from eggs.

Figure 4.1 - Foods from Poultry



Processed chicken patties and nuggets have also become popular. Many fast food restaurants sell chicken sandwiches and/or chicken nuggets. Food science researchers are striving to develop processing methods to create new products that would be acceptable to the public.

Dairy Products

Dairy products come from both dairy cattle and dairy goats. Most of the fluid milk consumed in the U.S. is produced by dairy cattle. Milk is the most common dairy product and is the base for other dairy products. Milk is generally pasteurized to kill germs and homogenized to keep the milk and cream particles mixed. Whole milk contains about five percent cream. Two percent milk has all but two percent of the cream removed before packaging. Skim milk has all the cream removed. Other dairy products include assorted cheeses, ice cream, butter, yogurt, sour cream, and cottage cheese.

Fish and Seafood

Many people enjoy eating fish and seafood. Freshwater fish include catfish, trout, and bass. Catfish and new hybrid fish are being raised on fish farms. Catfish can also be raised in ponds. Some farmers have experimented with raising catfish in indoor tanks to control the environment.

Saltwater fish are commonly harvested from the sea. Tuna, salmon, halibut, cod, and shark are saltwater fish.

Besides fish, many types of seafood are available in markets and restaurants. Seafood includes lobster, scallops, clams, shrimp, oysters, and crabs. Even lobster's freshwater cousin, the crawdad (or crayfish), is eaten in some areas.

Summary

There is a wide variety of food products produced from animals. Meat contains protein needed to maintain good health. Protein can also be acquired from dairy, poultry, and fish products.

Lesson 5:
Food Processing and Safety

Food Processing

Processing includes all the steps used to change raw agricultural products into consumable products. Raw products may go through from one to several of the steps in processing. Raw products can be cleaned, dried, weighed, refrigerated, preserved, stored, and changed in form. The more processing steps a product goes through, the higher the marketing cost. Processing raw products can be as simple as picking a peach off a tree. Processing can also be very involved like changing the form of the product by changing its taste, color, shape, and packaging. Whether simple or involved, food is processed to maintain or improve its fitness for consumers.

Reasons for Processing

Many foods are processed before they get to the consumer to make them more tasty. Some foods cannot be eaten raw. Processes are needed to change the raw product into a product that consumers can eat. Wheat is an example of a crop that is not very tasty in its raw form. Wheat is usually ground into flour. Flour is then made into breads, baked goods, or cereals. Products made from wheat flour are more tasty to the consumer than wheat grain.

Another reason for food processing is to enhance the storage of food products by preserving them. Preservation also makes food safer for consumption. If food is not preserved properly, spoilage and contamination can occur, which can lead to health problems. Salmonella, dysentery, typhoid, and cholera are diseases that can be caused by eating unsafe food. Care must be taken to ensure food is properly stored and prepared.

Transportation is another important step in food processing. Not all foods are produced in every state or country. Shipping food from centers of production to consumers is very important. Food that is not properly processed may spoil during transportation. This is a very costly problem for everyone involved.

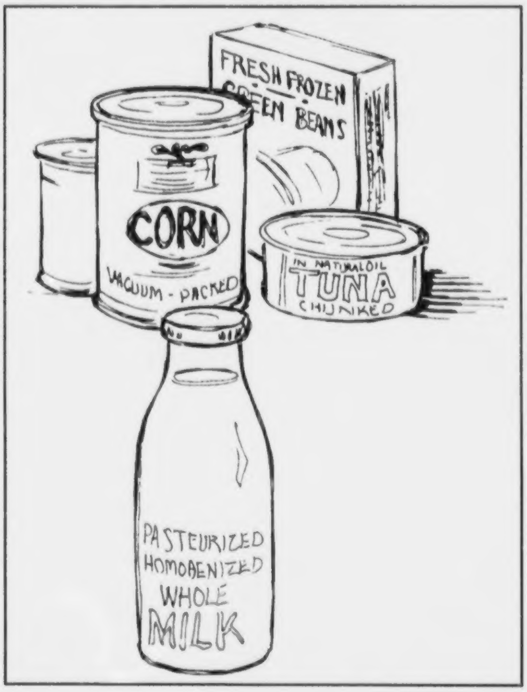
Another reason for processing food is for the convenience of consumers. Convenience is very important in the U.S. In the city, few U.S. citizens are willing to buy a live chicken to lay eggs. Also, few people would purchase a live animal when they want meat for their families. Convenience is important to consumers, and many foods are processed for customer convenience.

Preserving Food Products

Raw agricultural products can be preserved in many different ways. Foods are preserved so that they can be eaten at a later date. Foods can be frozen, freeze-dried, canned, dried, vacuum-packed, smoked and cured, fermented, irradiated, and pasteurized. Most foods can be preserved in more than one way. For example, carrots can be frozen, canned, dried, freeze-dried, or irradiated.

Freezing prevents many microorganisms from growing and even kills some. Foods should be frozen at 0°F (17°C) for best results. Once the food has been removed from the freezer, it needs to be used fairly quickly. Freeze drying combines

Figure 5.1 - Preservation Methods



freezing and drying. During canning, food is processed and sterilized by heating it to a temperature that kills most bacteria present. Canned foods have a long storage life.

Dehydrated foods also have a long storage life. Dehydration (drying) removes all moisture from the product. Sometimes the form of the product is changed into granules, flakes, or powder. For example, onions can be dried into flakes or powder.

Smoking preserves foods by exposing them to smoke for a specified amount of time. Preserving by curing is done by using salt, brine, aging, and smoking. Sometimes preservatives are added to the foods to ensure their safety. Ham is commonly preserved by smoking and curing.

Foods that have been vacuum-packed have all or nearly all the air removed from the container.

Fermentation is not only used to preserve foods, but it is used to make some foods more enjoyable to eat or more useable. For example, if coffee bean pods were not fermented, the beans would be difficult to remove from the pods.

Much research is being conducted on the process of irradiating food for preservation. Foods are moved along a conveyor belt into a special room where they receive a radiation treatment. The amount of radiation needed depends on the type of food and the desired length of storage time. The food is then moved by conveyor belt out of the room.

Pasteurizing is mainly used on dairy products. Pasteurization is the heat treatment of milk to destroy harmful bacteria. Pasteurization should not be confused with homogenization. Homogenization is not a preserving technique, but it is a treatment that keeps the cream mixed with the milk.

Processing from Producer to Consumer

Raw products go through several steps to get from the producer to the consumer. Producers grow plants and raise animals for the raw food products. The harvester removes the edible portions from plants in the field. The processor cleans, separates, handles, and prepares food for the distributor. Distributors store food until it is needed by wholesalers. Wholesalers sell fresh or processed foods to retailers. Retailers sell foods to consumers. Although consumers usually purchase food from retailers, in some cases, they may purchase food from the producer or wholesaler.

Food Product Safety

Chemical preservatives may be used in food preservation to retain the color and fresh appearance desired in food products. Regulations affecting the use of preservatives have been established by the federal government. Consumers are assured of a safe food supply because food quality is monitored by government agencies. The Food and Drug Administration (FDA) sets guidelines and restricts chemicals used as preservatives. The United States Department of Agriculture (USDA) employs inspectors to monitor the use of chemicals in food processing. The Environmental Protection Agency (EPA) regulates the use of pesticides in crop and livestock production. Such regulations are enforced to ensure the nation's food supply is safe. Government inspectors also examine food imported from other countries to ensure it is safe for human consumption.

Summary

Food safety and processing affects everyone because of the need for safe, wholesome food. The work of farmers and researchers in food science enables the U.S. and many other parts of the world to enjoy an abundant supply of quality food.

Lesson 6:
Fiber Products from Agriculture

Fiber Products from Plants

Most of the fibers produced in agriculture are made into clothes or material. Cotton is the most common fiber. For many years in the southern part of the U.S., cotton was considered "King." It was by far the most dominant crop.

Flax is the plant used to produce linen cloth.

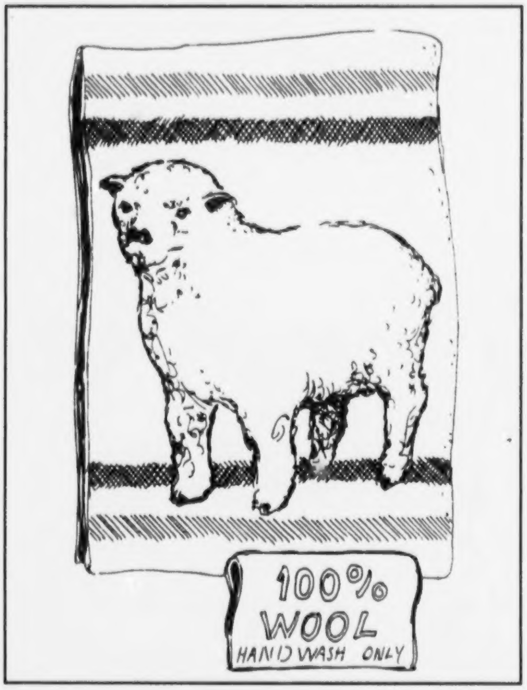
The hemp plant was used for many years to produce high-quality rope, burlap, and twine. Smoother nylon materials have been replacing hemp in rope production.

Humans have also been able to produce materials using cellulose from tree fibers. Acetate and rayon are both materials that are manufactured from cellulose fibers.

Fiber Products from Animals

Some fiber products are produced by animals. Wool is the most common fiber produced by animals. Mohair is produced by angora goats. Silk is the product of silkworms. The fibers used to spin the silkworm's cocoon can be unwound to make silk and rewoven to produce silk cloth. Paint brushes, violin strings, feathers, and surgical sutures are other items made from animal products.

Figure 6.1 - Wool from Sheep



Synthetic Fibers

Most of the fibers described above are produced from natural sources. Synthetic fibers are manufactured from raw materials such as coal, petroleum, and natural gas. Common synthetic fibers include acrylic, nylon, and polyester.

Synthetic Fibers vs. Natural Fibers

Natural fibers come from renewable resources, such as plants and animals that reproduce over and over. Synthetic fibers come from nonrenewable resources. Once the source of synthetic fibers is depleted, no more can be produced. Table 6.1 shows the different fibers from agriculture.

Table 6.1 - Natural Fibers vs. Synthetic Fibers

NATURAL FIBERS		SYNTHETIC FIBERS
Plant Origin	**Animal Origin**	
Cotton	Wool	Acrylic
Rope (Hemp)	Silk	Polyester
Rayon	Mohair	Nylon
Linen (Flax)	Paint brushes	
Acetate	Violin strings	
Burlap (Hemp)	Feathers	
Twine (Hemp)	Surgical sutures	

Summary

Cotton and wool are the most common fiber products in the U.S. Many of the clothes worn today are made from synthetic fibers. There is a limited supply of the raw materials needed to produce synthetic fibers. Therefore, the demand for natural fiber products is expected to increase.

Lesson 7:
Nonfood Products from Agriculture

Products from Grain

Many nonfood products are produced from grains. Ethanol, a fuel made from alcohol, is distilled from grain and mixed with gasoline.

Biodegradable plastics and plastic additives have also been processed from corn.

The most common use of grain is for livestock feed. Most grains can be fed to livestock. However, many products can be made from grains. For example, many inks are now made from soybeans instead of oil.

Figure 7.1 - Ethanol is Mixed with Gasoline

Products from Trees

Many nonfood products are produced from trees including lumber, paper, and cardboard. Some varieties of evergreen trees are also raised for Christmas trees. Charcoal, a product of timber production, is produced by partially burning the wood. Bark chips and mulch are also by-products of the lumber and paper industry and are used in landscaping. Turpentine, varnish and paints are also by-products of the forest industry.

Products from Other Plants

Some plants are grown for special purposes. Trees, shrubs, ground covers, and grasses are all grown for ornamental purposes. Such plants are used for landscaping, erosion control, producing shade, etc. Flowers are grown in landscapes and are also used in floral arrangements.

Plants can also produce things such as natural insecticides and medicines. Aloe vera is a plant that produces an oil used to ease the pain of minor burns. Perfumes are also made from plant parts.

Products from Livestock

Very little is wasted in the processing of livestock. It has been said that the only thing not used in the processing of hogs is the "oink." The excess fat from animal carcasses can be made into detergent. Products from hogs are also helpful in saving lives. Hogs help save human lives by providing insulin needed by diabetics and replacement heart valves for humans. Animal fats are also used to make soaps, glues, and candles.

Feathers from chickens and ducks are used to fill pillows. The hides of cattle and hogs can be used to make a wide variety of leather products. Leather is used to make clothing, upholstery, luggage, and book covers, just to name a few. Lanolin is an oil product extracted from sheep wool. Lanolin is used as a skin protector in hand lotion.

Many high protein meal products are produced during meat processing. Bones, feathers, blood, and fish by-products can be crushed, dried, and ground into meal products, fertilizers, or animal feeds.

Summary

Many nonfood products are processed from animals and plants. Some plants and animals are raised specifically for the special products made from them. Other products are by-products of plant or animal production.

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Lesson 1:
Conservation of Natural Resources

Natural Resources

Natural resource are living or nonliving things that are commonly found in nature. Examples of natural resources are minerals, oil, trees, wildlife, water, and soil. Natural resources are valuable to human beings. There are also recreational types of natural resources such as lakes, beaches, and mountains. Some natural resources have been used by people for their benefit.

Overuse of resources can create problems with the natural environment. For example, dumping trash or raw sewage into a lake or stream can destroy the habitat for fish. Over time, the fish may fail to reproduce, which upsets the balance of nature. Other examples of the abuse of natural resources can be identified in many communities. Each person should take steps to preserve the country's natural resources.

Renewable and Nonrenewable Resources

Natural resources can be divided into two categories: renewable and nonrenewable. Renewable resources can be replaced through proper management practices. For example, water is considered a renewable resource. Water is extremely important to people. Abundant and clean water is needed for human consumption, to irrigate crops, to feed animals, and for industrial uses. Each person in the U.S. uses about 150 gallons of water each day. Care must be taken with water supplies so they are not abused or polluted.

Trees are another renewable resource. Trees in nature that are left to grow, eventually become mature forests. A forest is similar to a city since it provides food and shelter for its inhabitants. Forests provide many major ecological benefits to humans. In cities, trees help purify the air, provide shade for buildings, and serve as a sound barrier against traffic noise. Water and trees are just two examples of renewable resources.

Figure 1.1 - Natural Resources

Nonrenewable resources are limited in supply. Nonrenewable resources must be handled carefully. Once used up, they are gone forever.

Crude oil is a nonrenewable resource that is used in the production of many products. Crude oil is distilled into various products such as fuels, lubricants, and chemicals. Once crude oil supplies are depleted, all the products made from crude oil will no longer be available.

Other examples of nonrenewable resources include natural gas, coal, and minerals such as iron ore. Each of these materials has been used extensively in the U.S. Researchers are attempting to find other ways to produce products that have been made from nonrenewable resources in the past. Finding other sources would help reduce this country's dependence on a decreasing supply of nonrenewable resources.

Conservation, the U.S. and the World

Many people think of conservation as simply collecting aluminum cans or having newspaper drives. Conservation involves the careful use of resources to avoid wasting them. Conservation can be defined as the "careful use and management of resources with wise plans for the future." People depend on natural resources for food, clothing, shelter, energy, and enjoyment. Therefore, it is important to conserve natural resources. Wasting natural resources will make them unavailable for use by future generations.

Protective Agencies

There are many U.S. agencies that have been established to manage natural resources. The Department of the Interior was established in 1849. This federal department has the primary responsibility for managing natural resources in the U.S.

Congress has passed laws to protect the environment, placing authority within agencies of the Department of the Interior. Agencies within the Department of the Interior monitor the use of air, water, forest, and mineral resources to ensure they are preserved. Several agencies in the U.S. Department of Agriculture are also responsible for preserving natural resources. In addition, the Environmental Protection Agency (EPA) was created by the Federal government to monitor the safe use of resources in the environment.

Several of the U.S. agencies and a description of their responsibilities are identified below.

1. The Bureau of Land Management is an agency of the Department of the Interior. It manages public lands, issues rights-of-way for crossing federal lands under another agency's jurisdiction, surveys federal lands, and maintains public land and mining claim records.
2. The Department of Fish and Wildlife is an agency under the Department of the Interior. It manages and cares for wild birds, endangered species, certain marine mammals, and inland sport fisheries. It also develops environmental stewardship, promotes public education, and provides opportunities for the American public to appreciate natural resources.
3. The National Parks Service is an agency under the Department of the Interior. This agency manages and administers the properties under its jurisdiction for the enjoyment and education of U.S. citizens. It also protects the environment and assists states and local governments in the development of park areas. The park service preserves and protects national monuments and historic sites.
4. The Environmental Protection Agency is under the Department of the Interior. It ensures environmental safety and protection by research and legislation. Also, it sets safety standards in air, water, land, chemicals, and many other areas that affect all life-forms.
5. The United States Forestry Service is under the U.S. Department of Agriculture. It manages and cares for all of the nation's woodlands and national forests.
6. The Soil Conservation Service provides technical expertise to the public in the area of soil conservation and works with soil and water conservation and concerned citizens. It is under the U.S. Department of Agriculture.
7. The Agricultural Stabilization and Conservation Service provides funding and technical services to land owners for the construction of diversion terraces, ponds, and flood control structures. It also makes payments to farmers to keep them from producing row crops on land that could erode. It is under the U.S. Department of Agriculture.

Summary

Natural resources include all living and nonliving things that are commonly found in nature. Renewable resources can be replaced. Nonrenewable resources are limited in supply. Conservation of natural resources requires the active participation of individuals working together to conserve needed resources and protect the environment. The responsible care and actions of each person can prevent the depletion of precious resources. There are several agencies in the U.S. government that regulate the use of natural resources. Wise use of natural resources will ensure their availability for generations to come.

Lesson 2:
Soil Conservation

Soil is a vital resource that is needed for the production of food and fiber crops. Soil may be considered as the basis for all life on earth. Nearly every product people use or consume can be traced back to the soil. Therefore, learning to conserve soil resources is very important.

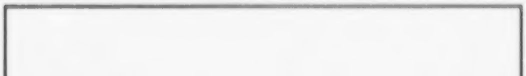


Figure 2.1 - Soil Erosion

Soil

By definition, soil is a naturally occurring mixture of minerals, organic matter, water, and air that supports plant growth. Soil is a relatively thin layer found on the surface of the earth. Soil not only supports plant life; it also supports homes, roads, and cities. Soil also serves as a holding area for many water sources. Soil provides a home for many forms of life. The area of soil that supports most plant growth is called topsoil. Topsoil varies in depth, depending upon the type of soil, parent vegetation, location, and the amount of erosion that has taken place.

Soil Erosion

Soil is generally considered to be a nonrenewable resource. However, soil can be formed given enough time, but it takes several hundred years to form one inch of soil. Soil erosion can remove an inch of topsoil on steep land in a single heavy rainfall. Soil erosion is the movement of soil from one place to another by wind or water. Movement of soil by erosion creates many problems.

The Problem

There are many types of soil, but not all soils are productive. Not all soils have the necessary nutrients to support plant growth. When soil is eroded by wind or water, small mineral and organic particles are carried away. The small particles contain valuable nutrients needed for plant growth. Erosion leaves behind larger, coarser particles and robs the soil of nutrients. The process of erosion leaves soils less productive.

Land on steep slopes is more subject to water erosion than flat land. Missouri has a serious problem with soil erosion as a result of its rolling terrain. Several tons of soil are eroded from land in Missouri each year. Soil lost through erosion affects people in many ways. The loss of valuable soil is not the only problem. When soil is washed or blown away, it collects elsewhere. Many times when soil is washed away it ends up in water ways such as rivers, lakes, and streams. The soil pollutes water supplies.

The Effect

Everyone is affected by soil erosion. Sediment deposited in lakes, rivers, and streams creates many environmental problems. Fish in streams muddied by soil erosion may be killed when their gills are clogged with soil. Many reservoirs lose water storage capacity because of sediment deposited following heavy rains or flooding. Harbors in many seaports must be dredged frequently to remove the soil sediment that settles to the bottom. Water supplies must also be filtered before they can be used. Each of these problems are expensive to correct. The cost of these corrective actions are usually passed on to taxpayers and consumers.

Farmers must use more commercial fertilizers to compensate for the less fertile soil that remains after erosion. Over time food costs will be expected to rise due to the higher costs of production. The natural environment is also damaged, which ultimately impacts everyone.

What Is Being Done

Soil erosion and its related problems are of national and international concern. The people of the world depend on the soil to grow food. Measures have been taken by farmers to protect and combat the problem of soil erosion.

Through research and working with farmers, universities are developing new farming practices to conserve the soil. Mining operations are regulated, and companies are required to replace the top soil that is removed during strip mining. Government agencies such as the Soil Conservation Service are helping landowners implement soil conservation measures.

Summary

Soil erosion is not just a problem for the U.S.; it is a problem for the entire world. The loss of productive soil affects the world's food supply. Soil erosion can be controlled through soil conservation practices. Individual efforts to implement conservation practices will be beneficial for everyone.

Lesson 3:
Water Quality and Conservation

Water Uses

Water is an important resource to sustain life. It is another precious natural resource that is used in many ways. People use water for drinking, cooking, and bathing. On farms, water is needed for animals and crops. Water is also used as a method of transportation by ships, boats, and barges. Industries use large amount of water for cleaning and cooling machinery and equipment. Many people enjoy recreational activities around the water such as boating, swimming, and fishing. Electric power can also be generated from dams placed in rivers.

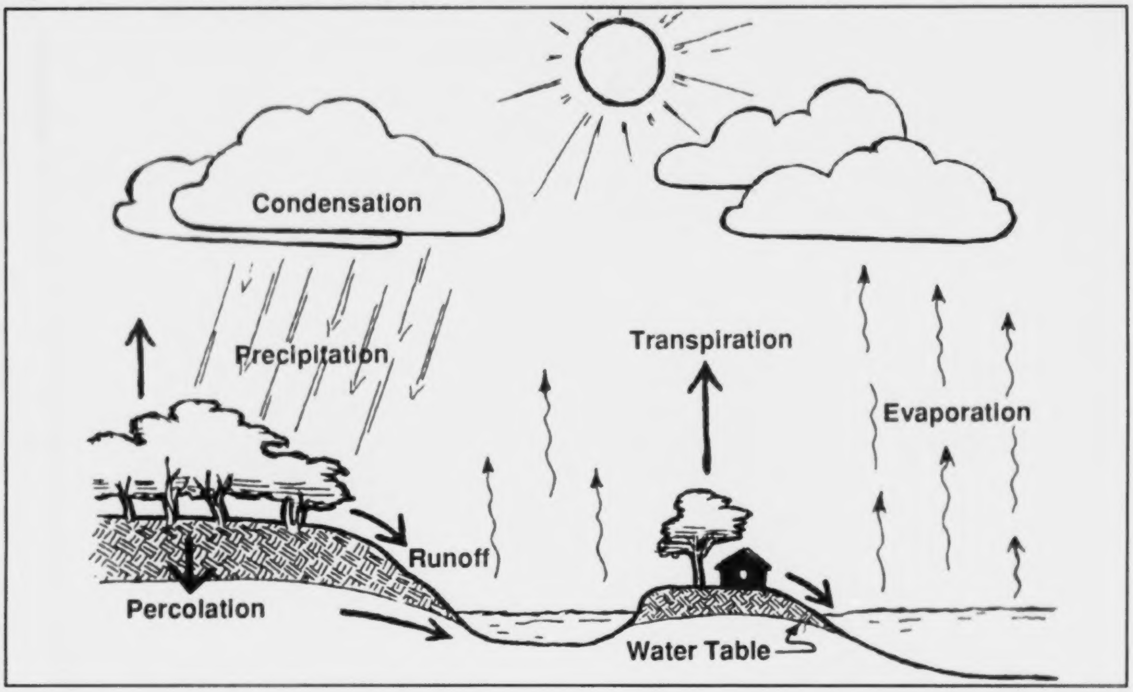
Water Purification

Although 70 percent of the earth's surface is covered with water, the majority is saltwater. Saltwater cannot be used to support human, animal, or plant life without expensive treatments to remove the salt. Therefore, freshwater supplies must be managed carefully to ensure an abundant supply of useable water.

Through natural processes, water evaporates from plants, the soil, and water surfaces into the atmosphere. Water vapor collects and is stored in clouds. When the temperature drops, the water vapor condenses. The condensed water vapor, called precipitation, falls to the earth in the form of rain, sleet, hail, or snow, depending on the temperature. After the precipitation falls to the earth, the process repeats itself. This process is called the hydrologic (water) cycle. See Figure 3.1.

As water changes from a liquid (during precipitation) to a gas (during evaporation) and back to a liquid (during condensation), it is purified. This

Figure 3.1 - The Hydrologic (Water) Cycle



is nature's way of keeping water supplies fresh and clean. However, "acid rain" is created when droplets of rain pick up air pollutants as they fall to earth. Acid rain falling on vegetation has been known to reduce plant growth. The northeastern part of the U.S. has had serious problems with acid rain. Acid rain is a result of high levels of air pollution created by industries located in the area.

Sources of Water Pollution

There are many sources of pollutants that can enter water sources and render them unusable. Municipal wastewater consists primarily of household water from toilets, washing machines, sinks, showers, and other uses. This wastewater runs through city and town sewer systems. Frequently, household wastewater contains residues from soaps, detergents, cooking oils, paints, household cleaners, and pesticides that may be toxic to the environment. Household wastewater may also be contaminated with organic materials, nutrients, bacteria, and viruses.

Industrial parks and factories are often connected into the municipal wastewater system. Often they dispose of chemicals and other wastes into the sewer system. Industrial wastewater used to cool machinery is often heated to the point where it can be harmful to fish and other wildlife. Cooling towers are often used by industries to return the water to a normal temperature before it is released into the environment.

There are nonpoint sources that cause pollution. An example of nonpoint source pollution is rainwater passing over farmland and carrying topsoil, pesticides, animal wastes, and fertilizers into nearby streams or lakes. Nonpoint pollution can also come from mining operations, timber harvesting, and construction sites.

Sanitary landfills, wastewater treatment facilities, underground storage tanks, chemical container disposal, and toxic waste disposal are other sources of water pollution. These types of pollution can usually be traced back to the source of the problem.

Water Protection

Since there are many sources of water pollutants, care must be taken when disposing of wastes. Many individuals, industries, and the government are working to protect water resources. Federal laws have been passed to protect water resources. Congress has provided money to states that need financial assistance to construct municipal sewage treatment plants, water quality monitoring systems, and for the enforcement of water protection.

Private individuals must also prevent pollutants from entering water sources. In the home, pollutants should not be poured down the sink or flushed down the toilet. Everyone should work together to protect water resources.

Water Conservation

Conserving water resources involves both private and public efforts. Conservation measures can be started at home by installing plumbing fixtures that reduce water waste. Repairing leaky fixtures and avoiding overuse of water is important. Many people waste water when taking long showers, watering the lawn, or washing their cars. During the summer months, many states restrict the use of water because of water shortages.

Figure 3.2 - Fix Leaky Faucets

CONSERVATION

Farmers are beginning to grow crops that require less irrigation. Industries are also implementing water recycling programs to cut back on water usage.

Summary

Water is a resource that every living organism needs to survive. Once water is polluted, it is costly to purify. Water conservation is everyone's responsibility. Even though water is considered a renewable resource, it can become polluted. People need to be aware of the importance of maintaining water quality. Also, they need to help prevent water pollution as well as reduce water usage.

Lesson 4:
Air Pollution

Air is a precious resource that is needed by humans, plants, and animals. Many people don't think about air as a resource, until something happens that makes it difficult to take a deep breath of fresh, clean air. Pollution threatens the quality of the air we breathe. As a result, air pollution can have an adverse effect on human, animal, and plant life.

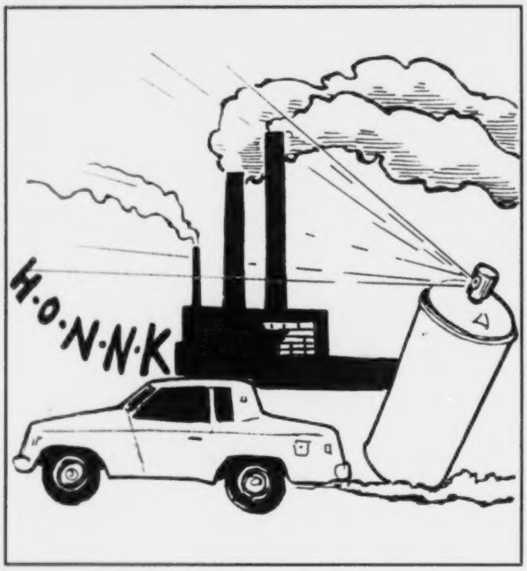
Air Pollution Defined

Air pollution is the contamination of air with particles or gases that are harmful to the environment. Air pollution is not new to the U.S. or other countries in the world. Throughout history, many serious problems have been caused by air pollution. In the 1940s, highly industrialized cities in the U.S. suffered from what was called "killer fogs." Air pollution in some cities was so bad that serious health problems arose because of it. Lung damage, respiratory problems, brain damage, eye and throat irritation, and deaths have occurred because of high levels of pollutants in the air. Air pollution can also be harmful to the production of livestock or crops.

Sources

There are many sources of air pollution. Air pollution sources can be organized into two groups. Mobile sources of pollution include cars, trucks, buses, boats, trains, and gasoline-powered portable tools that emit air pollutants. Stationary sources include electric utilities, factories, homes, and buildings that burn wood, natural gas, coal, oil, and other fuels for power, heat, or production. Confinement livestock production units and waste handling facilities can also contribute to air pollution problems.

Figure 4.1 - Sources of Pollution



Types of Pollution

There are different types of pollutants emitted into the air. Once they reach certain levels they can become hazardous to human, animal, and plant health.

Gaseous pollutants - Gaseous pollutants include carbon monoxide, nitrogen dioxide, sulfur dioxide, and hydrocarbons. These pollutants are produced from automobile exhaust and the burning of coal, oil, or natural gas. Gaseous pollutants are a serious problem on expressways and urban streets when traffic is slow and carbon monoxide fumes accumulate. Passengers and pedestrians can become drowsy and have slower response times when exposed to carbon monoxide.

Natural gas water heaters and furnaces may also cause a buildup of this odorless gas in a home. Without proper ventilation, a buildup of carbon monoxide can be fatal to inhabitants.

Burning coal that is high in sulfur content releases large quantities of sulfur compounds into the air. High levels of sulfur dioxide in the air contribute to "acid rain." Acid rain contains high levels of sulfuric acid. Acid rain has contributed to the destruction of trees and other plants in areas near heavy industry. Acid rain falling into ponds or lakes also changes the acidity of the water, which is harmful to fish and plant life.

Nitrogen dioxide is produced from burning gasoline and diesel fuel in automobiles and trucks. Many large cities suffer from nitrogen dioxide pollution, because of the number of automobiles used for transportation. Smog that contains these pollutants can be very harmful, resulting in breathing problems and eye irritation.

Hydrocarbons are evaporated petroleum products that can become a gaseous pollutant. Two major sources of hydrocarbons are gasoline engines and petrochemical refineries. Hydrocarbons can come from fuel tanks, carburetors, crankcase vents, and exhaust systems. All new automobiles are designed with emission controls to recycle hydrocarbon vapors back through the engine.

Odor - This type of air pollution is unique from other types. The enjoyment of the environment is very important to many people. Extreme odors make it very difficult and at times harmful to fully enjoy the environment. Some food processing plants and chemical plants emit strong odors that affect large areas. These are not the only sources of odor pollution. Confinement livestock production units and waste handling facilities can also produce offensive odors. Pungent smells of any kind can be offensive and may be considered a form of air pollution.

Particulate matter - Particulate matter is solid material that is light enough in weight to be carried in the air. Sources of particulate pollution include coal- and oil-fueled generating plants, automobiles, jet aircrafts, diesel-powered engines, wood burning stoves, and natural particulates such as dust. Smoke and soot produced from burning also contain small particles of ash.

Controlling Pollution

Much has been done to keep air resources clean. However, more must be done to ensure that clean, healthy air is maintained. One major step was the passage of the Clean Air Act in 1970. This Act directed the Environmental Protection Agency (EPA) to set standards for air quality.

Car manufacturers are required to meet specific emission control standards set by the Federal Motor Vehicle Control Program. These standards limit the amount of gaseous and particulate pollutants that enters the air. Vehicle inspection stations have been established to monitor the exhaust systems on cars. In many cities, the use of public bus and rail transportation is encouraged instead of automobiles.

Another method used to control air pollution has been to reduce the lead content in gasoline. Lead is added to gasoline to increase the octane level to avoid engine knocking. However, lead is an element that, when breathed excessively, can cause serious physical injury and brain damage. The Environmental Protection Agency has reduced the amount of lead contained in gasoline. Since 1970 there has been a 95 percent reduction in the use of leaded gasoline. New vehicles can only use unleaded gasoline, which has resulted in less air pollution.

In the 1980s and 90s, many cities have passed no smoking ordinances. These regulations have limited where individuals can smoke. Smoking in an enclosed room pollutes the air that everyone breathes. One of the keys to maintaining clean air is to educate people about air pollution. Each person should examine ways to reduce air pollution.

Summary

Clean, fresh air is essential for human, plant, and animal life. There are many sources of air pollution. Pollutants include gases, odors, and solid particles suspended in the air. Many steps have been taken to improve air quality. Everyone needs to consider what they can do to decrease air pollution.

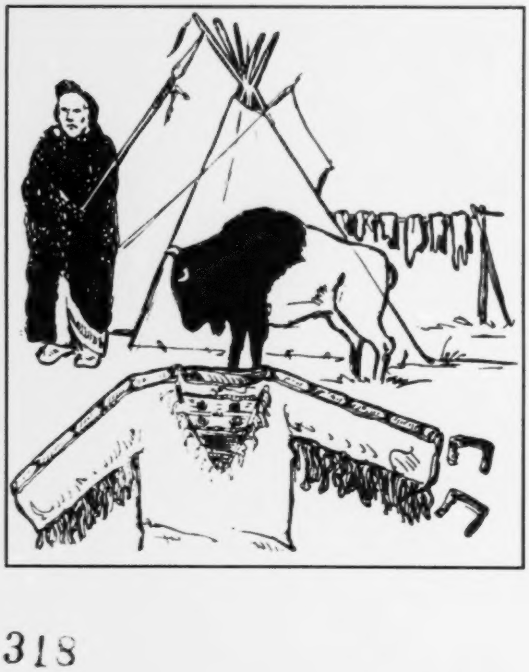
Lesson 5:
Wildlife Conservation

The term "wildlife" refers to all animals that live in the natural environment. Fish, birds, deer, bears, turtles, and foxes are examples of wildlife. This lesson is about wildlife in the U.S. and what people are doing to ensure their survival.

Early Role of Wildlife

Before the first European settlers arrived in the U.S., native Americans hunted wildlife for food and clothing. Native Americans killed only what they needed. Wildlife were abundant during colonial times.

Figure 5.1 - Wildlife Provided Food, Clothing and Shelter



As the number of settlers increased, more meat and furs were needed. Hunters began to kill more wildlife to feed and clothe the growing population. Fur trapping also increased to supply furs for the European market. The number of wildlife began to decrease as hunting and trapping increased.

As wildlife numbers decreased along the east coast, colonists moved farther inland to new hunting and trapping areas. Each movement destroyed more of the wildlife habitat, which further decreased their numbers.

Wildlife Today

Wildlife are no longer required for food and clothing. Today, wildlife are used for sport fishing, hunting, and for aesthetic enjoyment. Some people fish and hunt for recreation. Others enjoy bird-watching and wildlife photography. Many people also like to watch wild animals in zoos and animal parks.

The number of wildlife present today is only a fraction of the number present in earlier times. People have begun to recognize the need for conservation efforts. Several steps have been taken to protect wildlife from extinction.

Endangered Species

Several factors affect wildlife populations. These factors include loss of habitat, over hunting, pollution, and natural diseases and pests. Of these factors, loss of habitat is the greatest problem. Some species of animals have become so few in number that they are in danger of becoming extinct. Animals that are close to extinction are classified as an "endangered species."

Loss of habitat - Loss of habitat has resulted from human alterations made to the environment. As the population increases, more space is needed for homes and businesses. Less natural habitat is available for wildlife. Rerouting waterways and cutting trees are examples of how the environment can be altered. When habitat is destroyed, wildlife must adapt to another environment. As wildlife habitat is reduced, there are fewer places for animals to live.

Over-hunting - When wildlife are hunted in excess, the species may become endangered. Conservation laws allow hunting and fishing to maintain wildlife populations at acceptable levels. Restrictions on hunting may be imposed if wildlife populations are too low. Species that are endangered may not be hunted at all.

Natural diseases and pests - Natural diseases and pests may cause wildlife populations to decrease. Diseases and pests can kill wildlife or weaken survivors to the point they cannot reproduce. Harsh weather can also reduce wildlife populations. Severe cold or wet weather can be a problem when young are born or when eggs hatch. Large animal populations in a limited habitat can also increase the chances for disease or pest infestation.

Pollution - Environmental pollution can affect wildlife by making them sick or by killing them. For example, the pesticide known as DDT was used to fight mosquitos. DDT not only killed mosquitos, but it accumulated in lakes and ponds where it was sprayed. Fish in the lakes became contaminated with DDT which was passed to bald eagles when they ate the fish. DDT didn't kill bald eagles, but it caused them to lay thin shelled eggs. They were so thin that they broke before the birds were able to hatch. As a result, the use of DDT drastically reduced the number of bald eagles in this country.

Protecting Wildlife Resources

Everyone can participate in the protection and care of wildlife. Conservation laws and management techniques are used to protect wildlife. Laws have been established for managing wildlife resources. Strict laws have been passed to protect endangered wildlife species. Other laws regulate the hunting and fishing of wildlife.

The U.S. government passed the Endangered Species Act in 1973. This law protects certain animals from extinction. Animals threatened with extinction are placed on the Endangered Species list. Endangered species are protected by strict management guidelines. Hunting of an endangered species is not allowed. In Missouri, there are 182 animals on the endangered species list.

Local law enforcement officials enforce wildlife conservation laws. Law enforcement ranges from monitoring the number of animals killed during a hunting season to arresting and prosecuting violators. Hunting or possessing wildlife illegally may be punished by a fine or imprisonment.

Summary

Residents of the U.S. are no longer dependent upon wildlife for survival. Food and clothing needs are supplied by domestic animals and crops. Hunting and fishing today are forms of recreation. Many people support wildlife conservation efforts for the natural enjoyment and beauty. Several species of wildlife are limited in number. Conservation laws are designed to protect wildlife from extinction. Hunting and fishing laws attempt to maintain acceptable population levels. Many people are working to restore wildlife habitats that have been disrupted by an expanding human population.

Lesson 6:

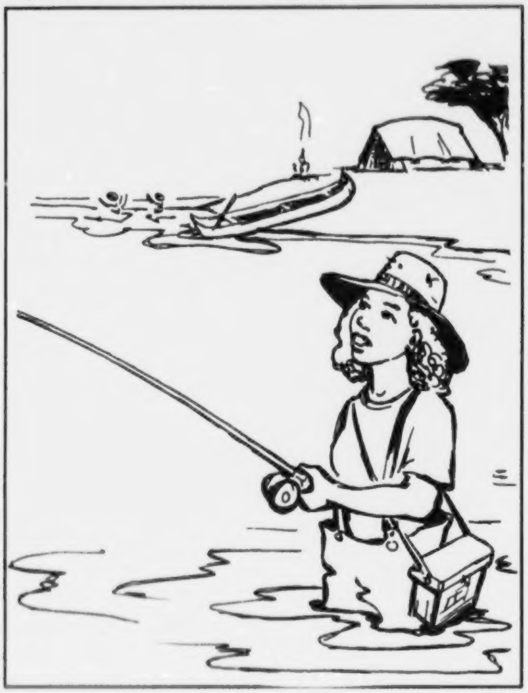
Outdoor Recreation

People have more leisure time to spend on outdoor recreation than in the past. Many Americans enjoy spending time in nature. Vacations are planned months in advance. Camping trips fill many summer weekends. Hunting and fishing are favorite pastimes of many people.

What is Outdoor Recreation?

Outdoor recreation includes all the recreational activities that are conducted in the natural environment. There are several recreational opportunities in the U.S. Local, state, and national parks are available in many locations. Lakes and streams are used for many kinds of water recreation. Forests and mountains are also used for outdoor recreation.

Figure 6.1 - Recreational Activities



Outdoor Recreational Activities

There are many types of outdoor recreation in this country. Lakes and reservoirs provide places for swimming, boating, fishing, and water skiing. Rivers and streams are also used for trapping, fishing, boating, and canoeing.

Hunting is a favorite pastime for many people. Forests, woodlands, and harvested fields are hunting areas for deer, turkey, quail, pheasants, rabbits, and other game animals.

Parks and nature trails are well suited for picnics, camping, and hiking. Wildlife preserves and nature areas are also ideal spots for bird watching and outdoor photography. Horseback riding and cycling are other popular activities.

Many cities and towns maintain public and private golf courses for people to use. Golf is an outdoor recreational activity that many people enjoy during the summer months.

National Park System

The National Park System is an agency of the federal government. Each year millions of people enjoy the 283 parks managed by the National Park Service. The National Park System was developed to preserve nature areas, historic sites, and recreational areas.

Nature areas include parks such as Yellowstone Park and the Grand Canyon. These parks do not allow hunting or fishing. The parks are maintained to keep human disturbance to a minimum. The goal of managing natural park areas is to maintain the natural beauty of the area for people to enjoy.

Historic sites managed by the National Park Service include monuments, cemeteries, battlefields, and memorials. Examples of historic sites are the Washington Monument, Arlington National Cemetery, Gettysburg, and the Truman Library. Historic sites are maintained to preserve certain aspects of the nation's history. Many families will visit historic sites as part of their vacation travels.

Recreational areas are managed by the National Park Service for recreational purposes. Such areas include scenic waterways, seashores, lake shores, and parkways. Use of these areas is closely regulated to protect the environment.

Careers in Outdoor Recreation

Outdoor recreation provides many career opportunities. The U.S. government employs many people in the National Park Service. Some of the careers include park rangers, park aides and technicians, park guides and guards, fish and service guides, and recreationists. The education required for these careers ranges from high school to advanced college degrees. Most of the careers involve work outdoors in a variety of weather conditions.

There are many career opportunities to manage and maintain state and local parks. Conservation agents are responsible for enforcing laws related to hunting, fishing, and trapping. Water safety patrols monitor boating on lakes and rivers in many states.

Private businesses provide careers for persons interested in providing outdoor recreational services. Managing canoe and boat rentals, bait and tackle shops, and golf courses are examples of such careers.

Wildlife biologists conduct research on many species of wildlife. Activities involved in wildlife biology might include population counts, observing the nesting or migration habits of waterfowl, or monitoring pollution in lakes and streams. Preparation for a career in wildlife biology would require a college degree.

Summary

Many people enjoy spending their leisure time in outdoor recreational activities. Outdoor activities range from picnicking to hunting and fishing. Several natural areas, historic sites, and recreation areas are available in the U.S. for outdoor recreation. There are also a number of opportunities for persons interested in a career in outdoor recreation.

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Lesson 1:
Picking the Proper Pet

Why Own a Pet?

People own pets for many reasons. Some of the reasons would include companionship, enjoyment, or to provide a way for family members to relax and reduce stress. Owning a pet can also help a child develop responsibility by caring for a pet. People also own pets to perform jobs including guarding property, hunting, and pulling sleds or wagons. Seeing-eye dogs also are used to help blind people.

Common Pets

Pets range in size from ants to horses. Rodents have become very popular pets. Most rodents used as pets have been domesticated from their wild relatives. Gerbils, guinea pigs, hamsters, mice, rabbits, and rats can be kept as pets.

Figure 1.1 - Pet Mouse

People should not think of wild mice, rabbits, and rats as pets. Wild animals should not be kept as pets. People should leave wild animals in their natural environment.

Larger mammals including cats, dogs, horses, and ponies are the most common types of pets. Many people have dogs or cats as pets. There are more than 100 breeds of dogs and 30 breeds of cats. Certain breeds of dogs and cats are better suited for pets than others.

Amphibians and reptiles are sometimes kept for pets. Most of these animals can be kept in a terrarium. Frogs, lizards, snakes, and turtles are amphibians and reptiles that may be kept as pets. These types of animals should only be purchased from a pet store.

Birds make excellent pets for many people. Birds that have been kept as pets include canaries, parakeets, parrots, and pigeons. Most birds are kept in cages although pigeons are generally kept in larger lofts. Singing birds are popular pets because they tend to create a cheerful environment.

Goldfish and tropical fish are frequently kept as pets in aquariums. Aquariums range from small fish bowls to large aquariums. Insects such as ants, butterflies, and praying mantises may also be kept as pets. Exotic animals such as llamas and pot-bellied pigs are becoming popular pets.

Selecting A Pet

Selecting the proper pet can be a difficult task. Many things need to be considered when selecting a pet. Some people know they want a dog, but they just need to decide on a breed. Others will need to decide which type of pet would be best. Many factors need to be taken into consideration to make this decision. Pets should not be given as a gift unless the person is prepared to accept the responsibility of caring for the pet. Selecting the proper pet is an important decision that requires careful consideration.

One consideration is how much time the pet owner will have to spend with a pet. Pets require regular care. This may require a commitment two or three times a day. Pets also need regular attention and play. Special attention to grooming and health care may also be required.

The space available for a pet is also important to consider. An apartment may be limited to a small pet. A rural home with more space may allow for larger pets. Space is needed for shelter, which may include a container, cage, or house. Space may also be needed for feeding and exercise.

Figure 1.2 - Pets Need Attention

The availability of money for expenses can also be a major concern. Some pets cost very little to keep. Others may cost hundreds of dollars per month. Some pets may be obtained free from friends while others must be purchased from breeders of registered animals. Food expense is also a major consideration. A large breed of dog that is obtained free can run up a large food bill. Some reptiles may require a steady supply of mice, which can become expensive. Special equipment and medical expenses can also vary greatly depending on the type of pet selected. Other expenses such as grooming, training, and housing differ from one pet to another and from one owner to another.

Two other factors to consider are the interest in a particular type of animal and the level of skill required to raise the animal. Persons who are not especially fond of animals should select one that they would enjoy. Some people may be allergic to certain animals and should be careful when selecting an animal for a pet. Also, unskilled persons should be cautious about selecting a pet that is difficult to raise.

Laws or restrictions may limit the types of animals that may be kept as pets. National, state, local, and housing unit restrictions may exist. Some apartment buildings do not allow pets of any type. Persons should become acquainted with all restrictions that apply before selecting a pet. Families should also decide who will be caring for the pet. This decision needs to be made before a pet is selected.

Obtaining A Pet

One of the more obvious places to get a pet is from a pet store. However, there are many other ways to obtain a pet. Purebred animals may be purchased from animal breeders. This generally ensures better knowledge of the animal's history. Many people obtain pets from friends. Animal shelters and the Humane Society often have a supply of pets for adoption. Many newspapers also have classified advertisement sections for pets. Regardless of where a pet is obtained, it is important to make sure the animal is healthy and has been cared for properly.

Possible Careers

The pet industry has career opportunities in a variety of areas. There are pet food careers in areas such as sales representative or nutrition researcher. There are also careers ranging from the development of pet equipment to managing a pet shop. Pet grooming is becoming popular, especially dog grooming. Veterinarians and veterinary assistants are available careers in the field of pet health care. There are many types of animal trainers that work with hunting dogs and horses. There are also many types of pet producers including breeders of horses, dogs, and cats. People that manage pet animals include zoo keepers, pet shop workers, and kennel managers.

Many of the careers in the pet industry provide people with the opportunity to work with their hands. Veterinarians, dog groomers, and pet trainers all work with their hands and work directly with animals. Most people in the pet industry will work with animals as well as with people.

Pet careers generally allow for year-round employment. However, many jobs in the pet industry have a low starting pay.

Careers in the pet industry require a basic knowledge of pet care. This knowledge is needed to help understand the job and to deal with customers. Human relations skills are also very important. Persons in the pet industry need to be able to work well with fellow employees, employers, and customers.

Patience and an interest in animals are also important to work in the pet industry. Temperamental animals may require extra patience.

Careers are available in many areas of the pet industry including pet foods, supplies, health care, training, and breeding. Persons interested in careers in the pet industry should be able to work with animals and people.

Summary

People own pets for a variety of reasons. Pets can range from insects to horses. When selecting which pet, people should consider many factors including the time and the space available for a pet. After deciding on the type of pet, there are many sources for obtaining a pet. There are also many career opportunities for persons interested in working with the pet industry.

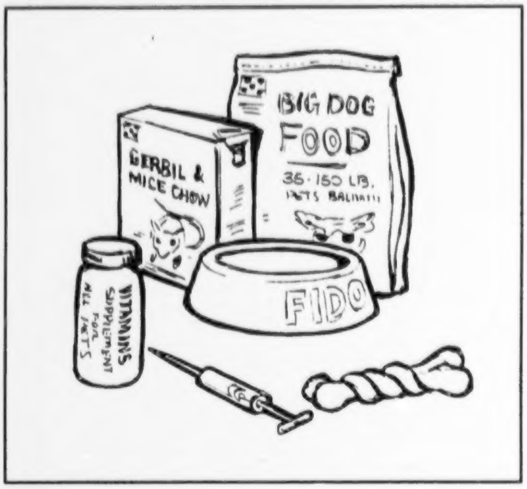
Lesson 2:
Owner Responsibility with Pets

Basic Pet Needs

Pets need a balanced diet to live, grow, and be healthy. A balanced diet includes all nutrients, minerals, and vitamins needed for the health of the animal. The type of food depends on the type of animal. Most animals also need clean, fresh drinking water every day.

Pets should be provided with a quality home or shelter. Most mammals and birds require warm and dry living conditions. Fish should be provided an aquarium with clean water. Rodents, amphibians, reptiles, insects, and birds should be kept in an enclosed cage. A quality home is necessary for a healthy pet. Health care for pets is also a basic need. Pets also need affection and exercise. Fish need sufficient room to swim around. Dogs and horses need regular attention and space to run and stretch their muscles. Some pets require special equipment or supplies for proper care. Horses require steel horseshoes to protect their hooves. Combs and brushes are used to maintain a clean coat of hair. Fish require aquariums. Sometimes the aquariums are temperature controlled with bubbles of air pumped through the water.

Figure 2.1 - Pet Supplies



Responsibilities of Owning a Pet

One of the most important responsibilities of ownership is to meet the pet's basic needs. Pets are dependent upon owners to meet their needs. Most pets need food, shelter, and space provided by their owners.

Some pets may require special licenses. Dogs commonly require dog tags. Some communities also require cats to wear identification collars. Licensing is one way to insure that pets have received vaccinations against diseases.

Good preventive health care is the responsibility of the pet owner. Preventive health care includes feeding a proper diet, keeping the environment sanitary, vaccinating pets against disease, and regular medical checkups. Pet owners need to provide emergency medical care as well.

Owners also are responsible to prevent their pets from having unwanted babies. Castrating males and spaying females are surgical procedures used to prevent unwanted pregnancies. Owners are also responsible for disposing pet wastes properly. Dog owners should be careful to prevent wastes from being deposited in the lawns of neighbors.

Costs of Owning a Pet

The cost of purchasing pets can range from free to several thousand dollars. People should not be misled by low initial costs. The purchase cost is only part of the expense. Expenses for food, shelter, health care, and equipment must also be considered. A free dog could cost hundreds of dollars to feed over a year's time. Expensive tropical fish may be cost very little to keep after the initial expense. Special equipment such as leashes, collars, horseshoes, and toys can add up to a major expense for some pets. Other costs such as special training should also be considered.

Pet Training

Animals kept indoors should be toilet trained. Dogs should be trained to deposit wastes outdoors. Cats and indoor rabbits can be taught to use a litter box. Pet owners may also train their pets to perform simple commands such as to speak, fetch, shake hands, sit, roll over, and heel.

Other training includes teaching birds to talk, horses to jump, or dogs to hunt. Dogs can be taught to guard property. Some dogs are also used to herd animals such as cattle or sheep.

Summary

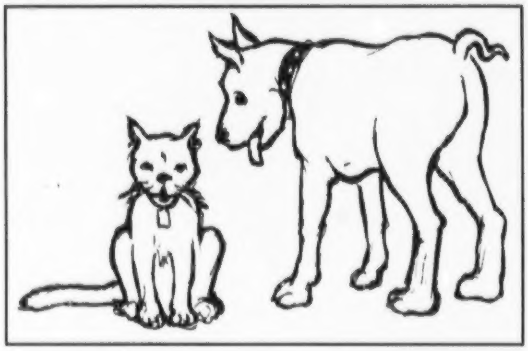
Pets have basic needs to live and grow. Pets should be provided with food, shelter, and space for proper exercise. Other specialized needs should also be considered. It is the owner's responsibility to help meet those needs. Meeting these needs and the expenses involved should be considered when deciding on a pet to own.

Lesson 3:
Managing Pets

Pet Grooming

Many pets require regular grooming. Some pets such as indoor dogs should also be bathed on a regular basis. Bathing helps to maintain their health and reduce flea problems in the home. Cats will usually clean themselves.

Figure 3.1 - Popular Pets



Cats, dogs, and horses may require regular brushing or combing to maintain a quality coat of hair. Some animals should receive special clipping or shearing to maintain the typical look of the breed. For example, poodles require special grooming.

Horses require shoes to protect their hooves. Cats are often declawed to prevent them from scratching furniture and curtains. Trimming the nails or hooves of pets is a common grooming practice. Other pets may require special grooming as well.

Basic Pet Health Care

Vaccinations are one of the best ways to supply basic health care. Just as people vaccinate small children against disease, animals are vaccinated to prevent diseases. Dental care with pets is an important health care concern. Control of internal and external parasites is also very important. Worming medications and external powders and sprays are used to control parasites on pets.

Regular exercise is important to maintain a healthy pet. If pets are allowed to become fat and lazy, they can develop additional health problems. In addition to the above concerns, regular medical checkups should be performed by a veterinarian.

Preventing Diseases

Good sanitation is necessary to prevent pet health problems. It is much easier to prevent health problems than it is to eliminate health problems once they occur. Good sanitary practices require keeping the animal's surroundings and equipment clean. Pets should also be provided with clean water and food. Water should be changed daily to ensure that it is fresh. Water and food bowls should be cleaned frequently to prevent a buildup of food particles.

A balanced diet is also essential to maintain a healthy animal, capable of resisting disease. Vaccination programs help reduce disease problems by building the animal's immunity to disease.

Sick animals should be separated from healthy animals. Sick animals can transmit health problems to others. People should avoid contact with animals that may be sick. Commercial producers frequently quarantine new animals to prevent outbreaks of health problems.

Disposing of Pets

The death of a pet is sad, but inevitable. All living things eventually die, which is a fact of nature. Pet owners are responsible to dispose of pets after death occurs. The pet could be taken to a veterinarian for disposal. Pet cemeteries are common in many larger cities. Cremation or burial at home are other options. Pet cemeteries and cremation may be an expensive disposal method. However, burial at a home may be restricted by local laws. One thing to remember about pets is that they frequently become part of the family. The death of a pet can cause feelings of grief.

At times, pets can have babies that are not wanted. This problem is best avoided by preventing the pregnancy by neutering the animal. However, persons with unwanted baby pets or who need to dispose of their pets should dispose of them properly. Animals may be given away to individual's, animal shelters, or pet shops. Individuals who accept pets from friends should understand and be prepared to accept the responsibility of caring for a pet. Animal shelters may require a fee to pay the cost of keeping the pet. Pet shops may accept some donated pets. However, they will generally only accept high demand animals or purebred animals with pedigrees. Zoos and conservation departments may also accept some unusual pets.

Summary

Good grooming and sanitary living conditions are two requirements for a healthy pet. It is better to maintain a healthy pet rather than cure a sick pet. Preventive health care is essential for a complete health care program. Pets that have died or are no longer wanted, should be disposed of in a humane manner.

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Lesson 1:
Lawn Care

Grasses are very important in the modern world. Grasses grown in the lawn are turfgrasses. Home lawns can be improved with good lawn care programs. In this lesson, the importance of lawn care will be discussed.

The Importance of Grass

Grass is important for many reasons. One of the most obvious reasons is the added beauty grass gives to the landscape. Without nice, green lawns the world would be less attractive. Besides adding beauty, grass protects the soil against erosion. Grass also provides a softer, more durable playing area. Children falling on grass get hurt less than when falling on bare soil.

Grass Areas

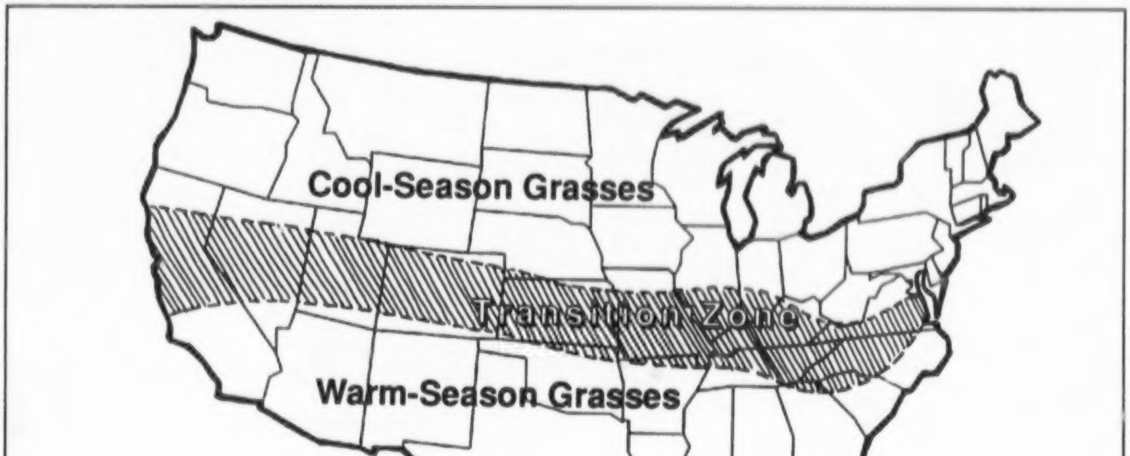
Grass is used in many places. Home lawns are the most common places. But it is also used around businesses and in parks. Grass is used on athletic fields and golf courses to provide a durable surface. Grass is also used along highways to provide a clean, cared for look. Frequently, lawn care services or groundskeepers are hired to care for grass areas.

Types of Grass

In a lawn care program, it is important to know what type of grass is in the lawn. There are two types of grasses used in lawns. The two types are grouped by the kind of weather in which they grow best. The two types are cool-season grasses and warm-season grasses. Cool-season grasses grow better in the northern part of the U.S. Warm-season grasses grow better in the southern part of the country. Although there is a transition zone in the middle of the U.S. where both can grow. See Figure 1.1.

Kentucky bluegrass, creeping bentgrass, tall fescue, and perennial ryegrass are examples of cool-season grasses. There are over twenty cool-season grass species grown throughout the world. Cool-season grasses grow best in 60° to 75°F temperatures. This is during the spring and fall in the Midwest. Warm-season grasses grow

Figure 1.1 - Growing Zones for Grasses



best in temperatures of 80° to 90°F. These are summer temperatures in the Midwest. There are approximately fourteen warm-season grass species grown throughout the world. A few examples are Bermudagrass, St. Augustine grass, and zoysia grass.

Elements of Lawn Care Program

The selection of a grass variety is the first part of a good lawn care program. The selection is based on the soil type and growing conditions. The amount of care the home owner can provide is a big part of the selection. Frequently, the type of grass that is already growing will need to be identified.

Once the grass is identified, a lawn care program can be developed to fit the owner's needs. The amount of fertilizer to use is very dependent on the desired level of maintenance. More fertilizer means more mowing but more beauty.

Proper mowing is a part of the program. This includes mowing at the proper height and at the right time. The proper amount of water needs to be applied at the right time. Water, like fertilizer, increases the maintenance level.

Compaction and thatch can be controlled by proper mowing, watering, and fertilizing. If all of these elements of the lawn care program are followed there will be a minimum of pests. Lawn pests include weeds, diseases, and insects. Control of pests is the final piece of the lawn care puzzle.

Mowing Height

The proper mowing height is dependent on the type of grass. Therefore, knowing the type of grass in the lawn is important. Cutting some grasses too short can stress the grass and cause areas in the lawn to die out.

A good rule of thumb is to cut no more than the top 1/3 of the grass blade length at any mowing. Mow warm-season grasses at 1 1/2 inches. Cool-season grasses can be mowed at 2 to 2 1/2 inches in the spring and fall. But, raise the height to 3 to 3 1/2 inches in the summer. Check with the local extension agent to find out the best mowing height for the type of grass in your lawn.

Tool Selection

A good selection of tools is helpful for a good lawn care program. Knowledge of the proper use of each tool is needed to do the job correctly. Some common tools, which are helpful in lawn care, are listed below and shown in Figure 1.2.

1. Walk-behind mower - either a rotary or reel type
2. Line (string) trimmer - to trim around the lawn
3. Sidewalk edger - to make smooth edges along concrete surfaces
4. Hedge shears - to trim shrubs
5. Lawn rake - to rake leaves and clippings
6. Garden rake - for pulling dead grass
7. Fertilizer spreader - for applying fertilizer, seed, etc.
8. Shovel or spade - for digging in the soil
9. Garden hoe - for removing weeds, etc.

Summary

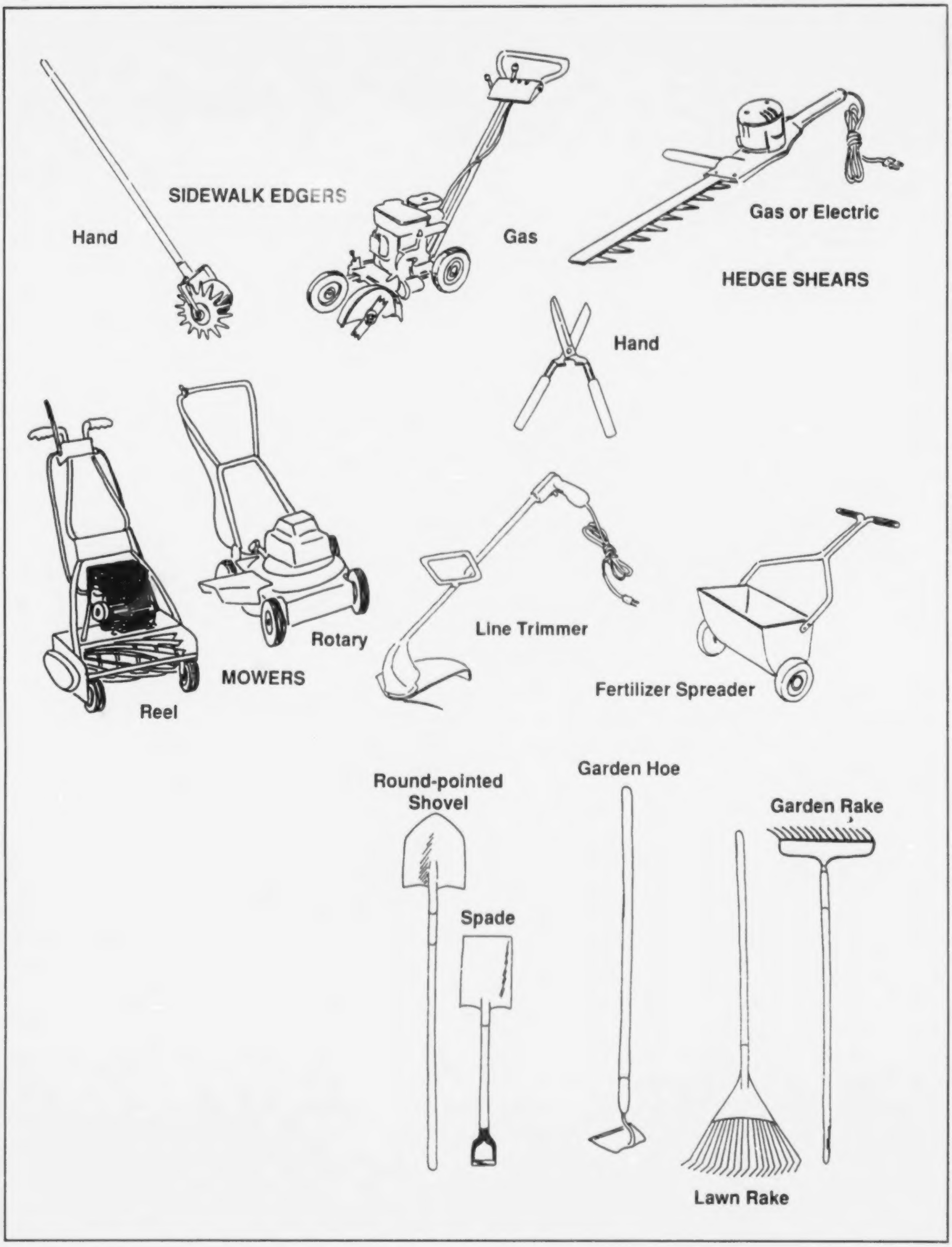
Grass is important for beauty as well as play. A beautiful lawn of dark green grass is enjoyable. By developing a lawn care program, a beautiful lawn is possible for everyone.

Lesson 2:
Lawn Mower Safety

Change in Lawn Equipment

The importance of having a beautiful lawn has changed over the last 10 to 15 years. Lawn care equipment has also changed. New types of equipment have come on the market and older pieces have been improved. One of the most important reasons for many of the improvements on lawn mowers is operator safety. Another consideration has been the safety of others. In this lesson, safety tips will be presented in relation

Figure 1.2 - Common Lawn Tools


SIDEWALK EDGERS
Hand
Gas
Gas or Electric
HEDGE SHEARS
Hand
Rotary
Reel
MOWERS
Line Trimmer
Fertilizer Spreader
Round-pointed Shovel
Garden Hoe
Garden Rake
Spade
Lawn Rake

to the operation of lawn mowers. Manufacturer installed safety features on power mowers will also be discussed.

Clothing

Protective clothing is very important when mowing the lawn. Always wear hard-toed, nonslip shoes or boots. Never mow the lawn in thongs, sandals, or bare feet. Long pants and a shirt can protect the operator against flying objects.

Precautions Before Mowing

Several steps should be taken before starting the lawn mower. First, read and understand the owner's manual. Pick up all loose items in the area to be mowed like cans, bottles, sticks, paper, and toys. Accidentally hitting one of these objects can be dangerous. Make sure there are no people, especially children, in the area to be mowed. Always check the mower to be sure that all safety devices are in place and working properly. Be sure that the conditions are okay to mow. Check to see if the grass is dry to prevent slipping. Also, be sure there is enough light to see well.

Lawn Mowing Injuries

Objects thrown from the mower can travel nearly 200 miles per hour. Most injuries occur from flying objects.

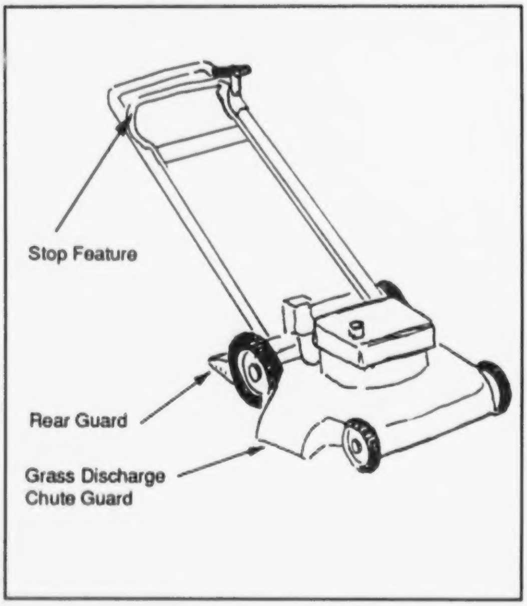
Lawn Mower Safety Features

New mowers have features designed to protect the operator. The grass discharge chute guard and rear guard are designed to decrease the chance of objects being thrown from the mower.

All new mowers also have automatic stop features. On walk-behind mowers, this device is a small handle that must be held against the larger push handle. The mower will not start without holding the two handles together. As soon as the automatic stop handle is released, the blade stops turning, and on some mowers, the engine quits. On riding mowers, the switch is under the seat. New riding mowers will not start unless the operator is in the seat. If the operator gets off the seat, the engine dies immediately. Many new mowers have the starter handle on the push handle. This keeps the operator away from the mower deck.

The safety features should never be tampered with or removed. These features are installed to ensure the operator's safety and the safety of others.

Figure 2.1 - Safety Features



Safety During Use

The operator must know how to operate the machine properly. This includes stopping the machine as well as starting it. When mowing a lawn, the operator should watch in front of the mower for the unexpected. When hills or slopes are in the lawn, mow across them with walk-behind mowers. Riding mowers are driven up and down the slope. Also, operators should not pull the mower towards themselves. If the operator slips, it is very possible to pull the mower over his or her toe or foot. When the mower's fuel level is low, the mower should be allowed to cool before refueling. Never refuel a hot engine.

Do not try to mow too fast. With a riding lawn mower, safe mowing speed is important. A good rule of thumb is to always operate a riding lawn mower at a speed in which the operator can stop or turn safely. A riding mower is designed for one rider, the operator. Never allow anyone else to ride as a passenger. Extra riders distract the operator and may cause an accident.

The operator must be in complete control at all times. The operator should also be aware of how the riding lawn mower is functioning and what is going on around the mower. Speed adjustments should be made according to the terrain. Slow down for tall grassy areas and on rough uneven surfaces. Be ready to make quick stops if needed.

Since electric mowers are powered by electricity, never mow in wet conditions. Always use a grounded extension cord that has no breaks or cracks. Keep the extension cord out of the mower's way. Running over the electric cord with the mower may cause a serious injury.

Summary

Several safety devices have been installed on mowers in the last 10 to 15 years. These devices are designed to protect the operator and others. Safety devices should not be tampered with or removed.

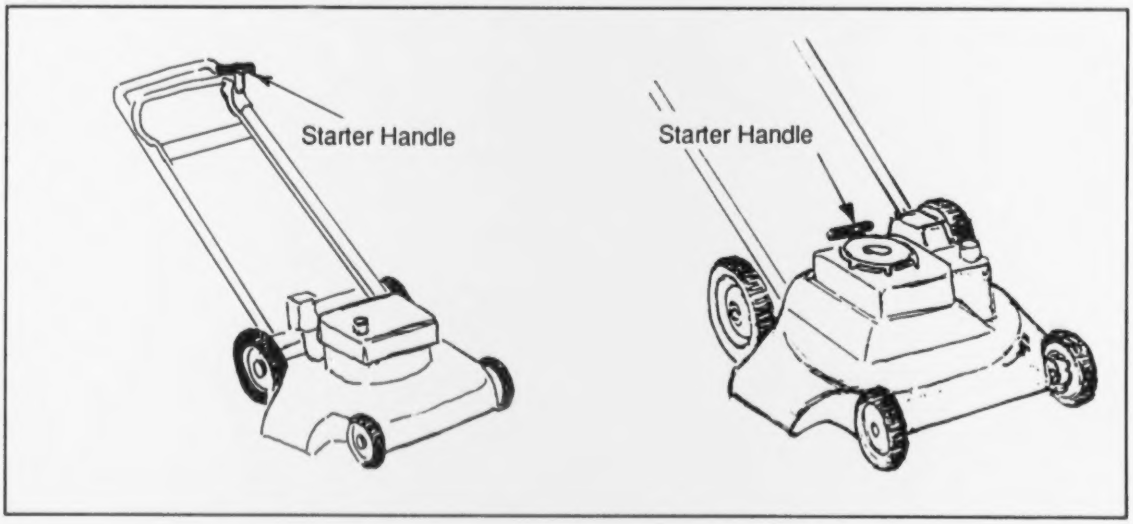
Lesson 3:
Lawn Mower Operation

Learning how to correctly operate a power lawn mower can be fun and sometimes lead to a way to earn extra money. Operating a lawn mower can also be dangerous if proper safety techniques are not used. In this lesson, procedures and techniques for starting and operating lawn mowers will be discussed.

Starting Gas-Powered, Walk-Behind Mowers

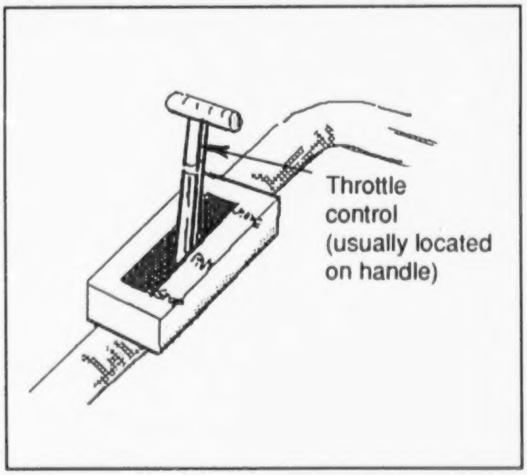
When starting a lawn mower, first clear the area of other people, animals, or debris. Also, check under the mower for debris. Make sure the mower is in a well-ventilated area, preferably outside, and on a level surface. Hold the mower firmly. Some walk-behind mowers have the starter handle attached to the mower's push handle. Others have the starter handle mounted on top of the engine. See Figure 3.1. Mowers that have the starter handle on top of the engine often have a place marked where the foot can be placed to steady the mower while pulling the starter handle. This marking is on the top of the mower deck, on the same side as the starter handle. Mowers with the starter handle attached to the push handle do not generally need to have a foot placed on the deck to steady the mower when starting it.

Figure 3.1 - Starter Handle Placement



The throttle, which controls the speed of the engine, should be placed in the choke position in the beginning. Pull the starter handle briskly. When the mower starts, the throttle should be moved from choke to run. Once the throttle control (Figure 3.2.) is in the run position, the speed can be adjusted according to the height of the grass.

Figure 3.2 - Throttle Control



The mower can be stopped by placing the throttle control at the stop position. Many lawn mowers have special safety devices that shut off the engine when the handle of the lawn mower is released. This helps prevent accidents. This safety device on the riding mower is a pressure switch under the operator's seat. When the operator lifts up off the seat the engine is automatically turned off.

Extension Cords for Electric Mowers

Mowing with an electric mower is limited by the length of cord. A rule of thumb is that a 14-gauge, three-prong, heavy-duty extension cord works well. Extension cords should not be over 100 feet in length. The mower owner's manual should give specific guidelines.

Mowing on Slopes

When mowing on slopes or hills with a walk-behind mower, always mow across the slope. Do not mow up and down hills or slopes. Mowing across slopes when using a walk-behind mower is safer and easier on the person operating the mower. With riding lawn mowers, extra care must be taken. Mow up and down the hills when using a riding mower. Only mow on land that is slightly sloping. Even then, the operator must be careful. Rolling over with riding mowers is a serious problem. See Figure 3.3.

Adjusting Cutting Height

Adjusting the cutting height of the mower should always be done when the mower is turned off. Once the mower's blade has completely stopped, adjust the cutting height to the desired level. A lever on each wheel is moved to change the position of each wheel. (Figure 3.4) Sometimes, older mowers need to be adjusted by changing a bolt position on the deck behind the wheel. This generally requires the use of a wrench.

Figure 3.3 - Mowing on Slopes

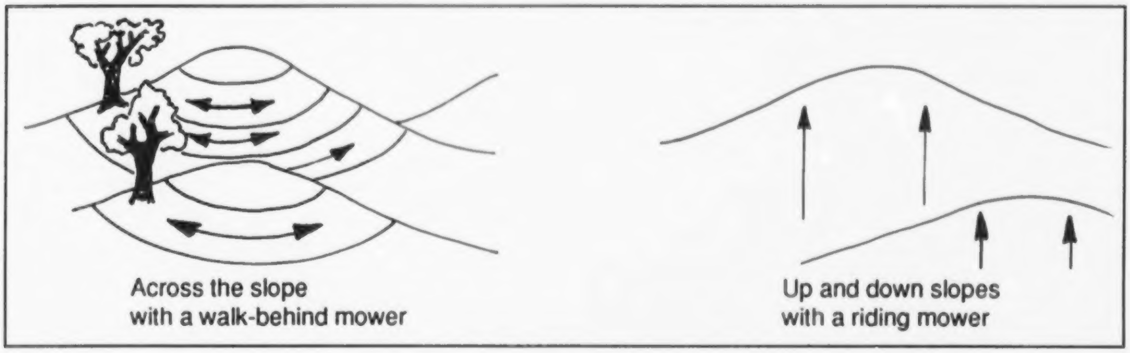
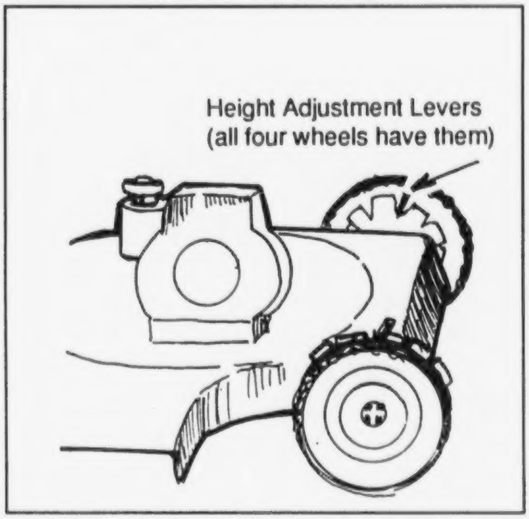


Figure 3.4 - Adjusting Cutting Height



Grass Clippings

It is best to leave clippings on the lawn. They provide nitrogen for grass. Mulching mowers cut grass into small pieces to help reduce thatch. Grass should be mowed at the proper height. If grass is allowed to grow too tall (the clippings can smother the grass below it) or if bagging the clippings is desired, clippings can be composted. Laws are being enacted that will prohibit dumping yard wastes in landfills.

Cutting Tall Grass

Remove any trash or debris from the area to be mowed. This is particularly important for tall grass because it is difficult to see hidden debris. Tall grass should be cut by raising the cutting height. Use a sharp blade. If the blade is not sharp, the engine will stall out. Cut the grass so that the mower blows the grass clippings away from the unmowed area. This will prevent a thick buildup of clippings in the tall grass.

Flower Beds, Shrubs, and Trees

Care must be taken when mowing around flower beds, shrubs, and trees. Always mow around flower beds, shrubs, and trees with the lawn mower's grass discharge chute pointing away from them. Do not blow grass clippings into flower beds, shrubs, or trees. Be careful not to hit or damage tree trunks with the lawn mower. Wounds in tree bark will allow insects and diseases to enter. Sometimes this can eventually kill the tree.

Storage Between Uses

After the job is completed, allow the mower to cool down. Clean off all grass clippings, leaves, and trash. Store the lawn mower in an area out of the weather, such as a garage or tool shed. If this cannot be done, place a water-proof tarp over the mower to protect it from the weather. Keep the mower clean and dry.

Summary

As one can see, mower operation deals with activities important to lawn mowing jobs. Most mowers, even though they may differ, can be started, operated, and stored in much the same way. Once these operation skills have been mastered, the opportunity to mow the home lawn or for a summer job is possible.

Lesson 4:
Lawn Mower Maintenance

The care of tools and equipment is very important. One reason is that most equipment, especially lawn care equipment, is quite expensive. Another reason is when the tool or mower is needed, it should be ready for use. Proper maintenance will keep mowers in good working condition.

Changing Oil

Keeping clean oil in the engine of the lawn mower is very important. Oil lubricates the internal parts of the engine. Oil that has not been changed in a long time can have dirt or other materials in it. Dirty oil causes excessive wear on the internal parts of mowers.

The oil of a new lawn mower should be changed after the first five hours of operation. After that, it should be changed at least every 25 hours of operation. If conditions are extremely dusty or dirty, the oil should be changed more often. Oil should be changed at least once a year.

In a two-stroke engine, the gasoline and oil are mixed together. It should be mixed according to manufacturer's recommendations. There is no oil to change. Electric mowers also do not have oil to change.

Air Filters

The air filter is another important component to be checked and kept clean. The air filter is important because it filters out dust or dirt particles from the air. This keeps them out of the engine.

In most lawn mowers, clean the air filter every 25 hours of operation. If conditions have been dirty and dusty, check and clean the air filter more often. If the filter shows signs of hardening or deterioration, it should be replaced with a new one.

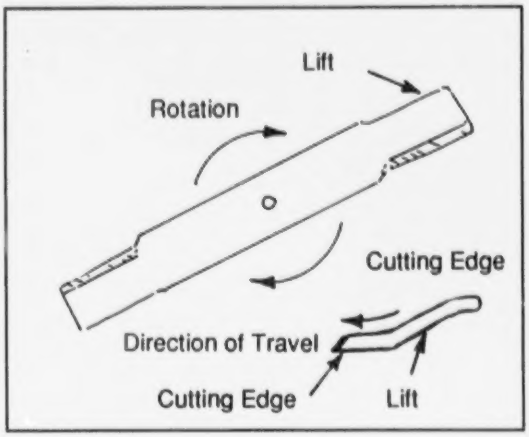
Before replacing a sponge air filter, drop a few drops of oil on the filter. Squeeze the filter to allow the oil to be distributed throughout the filter. This oil collects dust, thus decreasing the amount of dust particles passing through the filter.

Blade Care

What should you do if the mower is running fine, the oil has been changed, and the air filter has been cleaned, but the lawn looks terrible after it is cut. This is a sign that the blade needs to be sharpened. The blade should be sharpened after 20 to 25 hours of operation. This can be done more often if necessary depending on the condition of the blade. The blade should be removed from the mower and sharpened either with a hand file or on a grinder.

The blade should be replaced if it is twisted, has lost its lift, (See Figure 4.1.) or is severely worn. Most blades will last a long time with proper care. The cutting job will be easier and look much better if a sharp blade is used.

Figure 4.1 - Blade Lift



Mower Cleaning

Mowers should be kept clean. Lawn mowers last for years if they are properly maintained and cleaned after each use. Dust, dirt, grass clippings, and other materials get all over the engine and under the mower deck. After a while, this can clog up air filters and discharge chutes.

Mowers should be cleaned after each use. Cleaning the mower can be easily done, if one gets into the habit. First, allow the mower to cool down. Then, brush or wash off the engine and upper deck of gas-powered mowers. The underside of the deck should also be cleaned to remove any material that has stuck. Sweep off the deck of electric mowers with a broom. Keeping the mower in good condition assures that it will be ready for the next job. Store the cleaned mower in a dry area until needed again.

Winter Storage

In many states, winter months are filled with cold temperatures and snow. There is obviously no need to mow the lawn. During these months the lawn mower needs to be properly stored.

The first thing to do is to clean off dust, clippings, or debris from the engine. The upper and lower deck areas should also be cleaned. Drain the old oil and replace it with new oil. Let the mower run for a few minutes and then shut it off. Take out the air filter, clean it, and put it back into place. It should be replaced if necessary. Next, drain all the gasoline out of the gas tank and the carburetor.

Remove the spark plug and put an ounce of engine oil into the cylinder. Slowly pull the starter handle to allow the oil to cover the cylinder. Replace the spark plug but leave the wire disconnected. Spot lubricate areas such as the wheels, throttle cable, and other moving parts with light weight oil. Remove and sharpen the blade and replace it. Store the mower in a place that is clean and dry. With electric mowers, clean thoroughly and maintain the blade as with the other types of mowers.

Summary

Proper maintenance of a lawn mower can keep it in good shape. It will help the mower last for years and also help keep it in working condition when it is needed.

Lesson 5:
Trimmer and Edger Safety and Operation

Many people use power trimmers or edgers. If these tools were purchased new from a store, they came with an owner's manual. This manual contains safety and operation guidelines for the specific tool. These guidelines should always be followed.

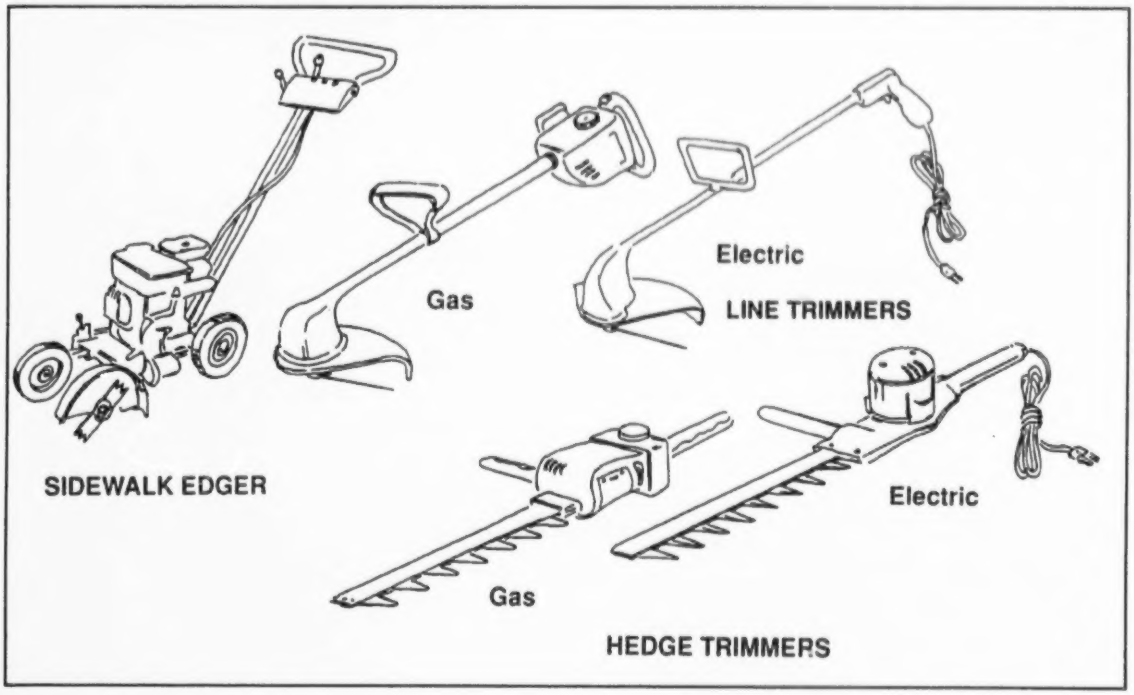
Types of Trimmers and Edgers

There are several types of trimmers and edgers available. Three common types include gas- and electric-powered line trimmers, sidewalk edgers, and hedge trimmers.

Clothing

When using trimmers or edgers of any kind, the operator should wear proper clothing for protection. Flying objects can cause injuries to the eyes and body. Safety glasses or goggles are a

Figure 5.1 - Common Trimmers and Edgers



must with trimmers and edgers. To ensure stable footing, wear nonslip boots or shoes. The operator should also wear long pants and a shirt because of flying objects.

Safety Precautions

When purchasing and using trimmers and edgers, safety must be a prime consideration. Before buying an edger or trimmer, find out about the safety of the brand that interests you. Many lawn tools today are equipped with safety features, but some are constructed better than others. Select a tool that fits the jobs to be performed. It should by easily handled by the operator. If the tool is too heavy or awkward to hold or operate, it could be unsafe to use.

After purchasing the tool, read the owner's manual to understand the machine and its limitations. Accidents are frequently caused by operators who are unfamiliar with the tool. Use the tool only for its specified purpose.

Before starting the tool, remove debris from the job area. Objects like rocks or boards can become dangerous flying objects when contacted by the tool. While operating an edger or trimmer, be aware of the surroundings and be prepared for the unexpected. Even though the operation of many of these tools is simple, proper procedures should always be followed.

Starting Gas-Powered Edgers and Trimmers

Gas-powered edgers and trimmers are started in a similar way as gas-powered lawn mowers. Make sure that the blades or line-head area is clear. Place the throttle control in the choke position and pull the starter handle. When the engine begins to run, move the throttle control from choke to run. Adjust the throttle to the desired speed.

Starting Electric Trimmers and Edgers

Plug the tool into a good, grounded extension cord. Refer to the manufacturer's manual for the size and type required. Make sure the cutting blade or line head is clear of any obstacles before starting. If the line trimmer is not an automatic line-feed type, always adjust the line length before starting the trimmer. Pull the trigger switch to operate.

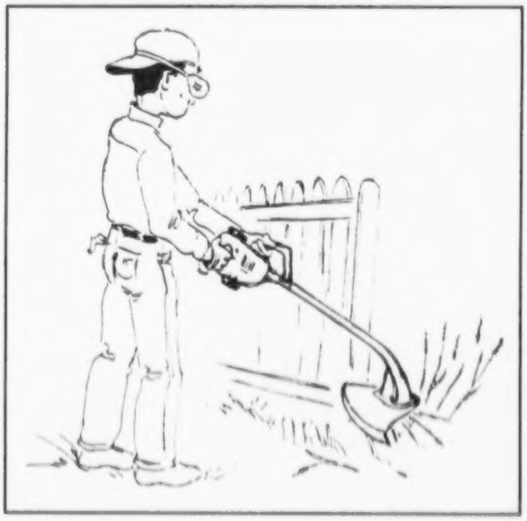
Use of Trimmers and Edgers

Edgers and trimmers can be used for a variety of jobs. The power of the tool and the size of the line or blade will determine the type of plant materials that the trimmer or edger can cut. Edgers can be used along sidewalks, driveways, and around flower beds. Line trimmers can be used along the bottom of fences to cut hard to reach weeds, along the side or edges of house foundations, and in many other areas. Most line trimmers or sidewalk edgers are made to cut smaller weeds and grass. On some trimmers, cutting blades can be used to cut woody plants up to two inches thick. Hedge trimmers usually can cut branches up to one-fourth inch thick. The use of these tools cuts down on the hours of labor that would be needed to do the same jobs with the older style tools.

Summary

When using power trimmers and edgers, always remember that the operator must be in complete control of the tool and be aware of the job and

Figure 5.2 - Using a Line Trimmer



surroundings. Power trimmers and edgers can make hard jobs easier. Understanding safety and the tool itself can make each job a safe one.

Lesson 6:
Trimmer and Edger Maintenance

There are many types of power edgers and trimmers that reduce labor time. It is important to take care of edgers and trimmers to ensure that they work properly. This lesson is about the proper care and maintenance of edgers and trimmers.

Two-Stroke Engine Fuel

Many trimming tools are powered by two-stroke gas engines. These engines are small and need a special gasoline and oil mixture to run properly. The oil is mixed with gasoline to lubricate the internal engine parts. A two-stroke engine does not have a separate oil chamber.

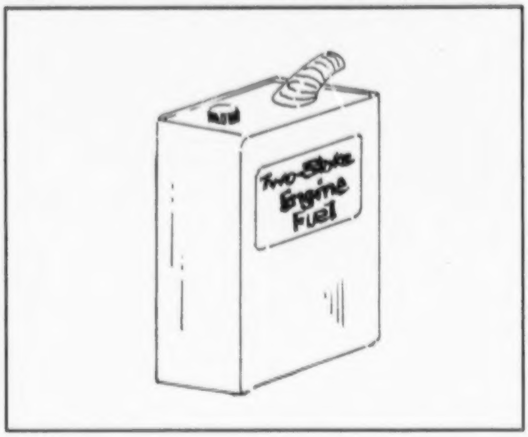
When mixing the oil with gasoline, follow the manufacturer's recommendations on the type of oil, type of gasoline, and the ratio of gas to oil. Use a properly marked container for the mixture. Be sure the gas and oil are mixed well by shaking the container. Here are some steps to follow:

1. Always mix in a well-ventilated area and never around any type of open flame or spark.
2. Pour half of the recommended amount of gasoline and the recommended amount of oil into the container.
3. Close the lid and shake the mixture.
4. Pour in the remaining amount of gasoline and shake again until completely mixed.

Replacing Blades and Lines

Old, dry lines should be replaced on line trimmers. Lines should also be replaced that have run out or become too short to use. Be sure to use the proper type and size of line for the equipment.

Figure 6.1 - Label the Two-Stroke Engine Fuel



Rotary blades on edgers need to be kept sharp and in good condition, like the blades on lawn mowers. Blades that have excessive wear or have been damaged need to be replaced.

Cleaning and Storage

All trimmers and edgers need to be properly cleaned and stored. Continued use depends on good care. Before storing these tools, make sure all surfaces are clean. Clean air filters and replace them if they are old or damaged. If gas-powered, empty gasoline and oil mixture out of the gasoline tank and carburetor. Lubricate any moving parts such as throttle controls. The blade should be sharpened, and the line should be replaced, when necessary. Store the trimmer or edger in a clean and dry place.

Summary

Trimmers and edgers are time savers that make hard jobs easier. Be sure to take proper care of them to ensure a long life of good service. Proper care includes using the proper fuel mix and replacing line when needed. Trimmers and edgers should be stored properly when not in use.

Credits

Colvin, Thomas S. Operating Tractors for Grounds Keeping and Ornamental Horticulture. Athens, GA: American Association for Vocational Instructional Materials, 1974.

Herd, Amon. Operating and Storing Small Engines. University of Missouri-Columbia: Instructional Materials Laboratory.

Lawn, Garden and Power Equipment. Owner's Manual, Intertec.

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Outdoor Power Equipment Repair. Stillwater, OK: Mid-America Vocational Curriculum Consortium, Inc., 1985.

Safe Mowing is Better Mowing. Slide Set and Script. U.S. Consumer Product Safety Commission, Washington, D.C. 20207.

String Trimmer. (Service Manual) 1st ed. Overland Park: KS, Intertec Publishing Corporation.

Lesson 1:
Fire Safety

Every year household fires claim the lives of hundreds of people. Household fires also destroy millions of dollars of property and personal belongings. Steps can be taken to reduce the risk of a household fire. Every member of a household should know the precautions that can be taken to prevent fires. Also, each person should be aware of safety procedures in case a fire does occur.

Causes

There are many causes of household fires. Two common causes of fires are falling asleep while smoking in bed and smoking while sitting on a couch or stuffed chair. Careless smoking should be avoided to prevent fires.

Electric shorts and overloaded wall receptacles can start fires. When using electrical appliances, do not overload a wall receptacle with too many plugs. Using a frayed or worn extension cord can also create a spark, which can cause a fire. Always make sure extension cords are in good repair before use.

Another cause of home fires is improperly stored flammable materials. Paints, solvents, and gasoline should be stored in properly marked containers and in vented storage cabinets. Stacks of old papers or oily rags can also ignite causing a fire. Trash, papers, and oily rags should be discarded and not piled near flammable materials.

In the U.S., the number one cause of household fires is heating equipment. Oil furnaces, gas furnaces, and wood burning stoves are commonly used to heat homes. Thirty percent of all home fires are caused by heating systems. Cooking causes 15 percent of all household fires. Grease fires on the kitchen stove related to cooking are fairly common. Fires caused by old papers and oily rags account for 10 percent of all fires.

Types of Fires

Fires can be classified as one of four types: Types A, B, C, and D. Each classification is based on the source of the fire. Knowing the source is necessary to properly extinguish a fire.

Type A fires - This type of fire is caused by ordinary combustibles such as wood, cloth, paper, rubber, plastics, and other common materials that burn easily.

Type B fires - These fires are caused by flammable liquids such as gasoline, oil, grease, tar, oil-based paints, lacquer, and flammable gas.

Type C fires - This class of fires is caused by electrical equipment, wiring, fuse boxes, circuit breakers, machinery, appliances, and overloaded wall receptacles.

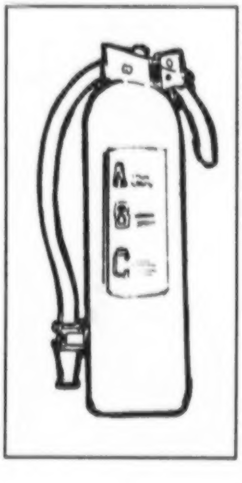
Type D fires - These fires are caused by combustible metals and metal dust, which is often found in industry; not on farms or in homes.

Knowing how fires are classified is important because fire extinguishers are also classified in the same way.

Types of Fire Extinguishers

When purchasing a fire extinguisher, look for specific information on the equipment. The information should include operating instructions, maintenance instructions, clearly marked ratings, and Underwriters Laboratory (UL) and/or Factory Mutual (FM) approved stamps. This information should be labeled and listed clearly. Fire extinguishers are available in several models: pump tank, stored pressure, and cartridge operated.

Figure 1.1 - Fire Extinguisher



When using a fire extinguisher, remember that the fire extinguisher must be suitable for the type of fire. Fire extinguishers are classified for a single type of fire or multiple fire types. There are A, B, C, and D type fire extinguishers. These extinguishers are classified for one type of fire. For example, if there was an electrical fire, you would use an extinguisher marked for a Type C fire. Water should not be used on a Type C fire due to the electrical shock hazard. Some extinguishers are approved for multiple fire types. Fire extinguishers with a type rating "ABC" can be used on ordinary combustibles, flammable liquids, or electrical fires. ABC type extinguishers are commonly used to put out small fires in the home.

Table 1.1 - Extinguisher Types

Extinguisher Type	Source of Fire
A	Ordinary combustibles (wood, paper, cloth, etc.)
B	Flammable liquids (gasoline, kerosene, etc.)
C	Electrical
D	Metal and metal dust

To use a fire extinguisher properly, start at the base of the fire and use a side to side sweeping motion to wet down all surfaces. Keep your back to the escape route when extinguishing a fire. Never move into a position where the escape route can be blocked by a spreading fire. Also, be ready to continue to discharge the fire extinguisher in case the fire restarts.

Fire Extinguisher Maintenance

Fire extinguishers that do not work properly are dangerous. A fire extinguisher should be inspected for the proper amount of charge every month. Annual inspections should examine the mechanical condition of the extinguisher. If a fire extinguisher is undercharged, have it recharged and ready. If the extinguisher cannot be recharged, dispose of it properly and purchase a new one. Always ensure proper fire protection by having properly rated and charged fire extinguishers. Fire extinguishers of the proper type should be stored in locations where house fires of each type are most likely to start.

Smoke and Heat Detectors

There are two types of early fire warning systems on the market. They are heat detectors and smoke detectors. Smoke detectors sound a warning alarm when the amount of smoke in an area reaches a certain level. A small amount of smoke may not set off the alarm. However, as the density of smoke increases, the alarm will begin to sound.

Heat detection devices, or "fixed temperature detectors," are triggered to sound an alarm when the air temperature exceeds the fixed temperature. Most heat detectors are preset to sound an alarm when the temperature exceeds 135°F.

Many of these detectors are powered by batteries. Some units are powered by the electrical current in the home. According to the National Fire Protection Agency Code No. 74, it is required that AC or battery-powered detection alarms be able to sound an alarm of 85 decibels for four consecutive minutes. Anything less is not approved. Batteries should be checked monthly to ensure the equipment is working properly.

When installing warning systems, proper placement is important. Smoke detectors should be placed on the ceiling in hallways outside of sleeping areas with one on each level in the home. Heat detectors should be located in the kitchen, furnace room, garage, attic, and utility room. A combination of heat and smoke detection units should be used along with battery and AC power source models.

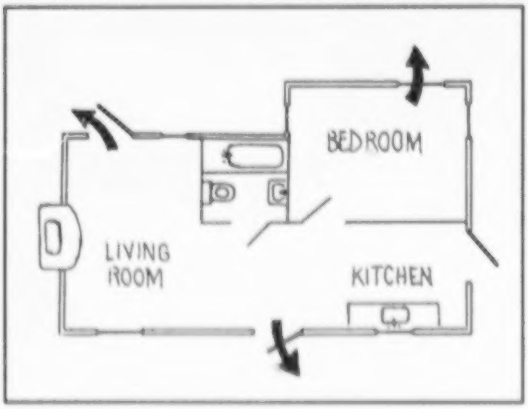
When mounting fire warning devices on the ceiling, it is recommended that they be placed in the center of the room. Placement should not be closer than 12 inches from a wall. If mounted on a wall, the unit should be placed no closer than six inches from the ceiling and no farther away than 12 inches.

Fire Escape Plan

Planning is an important step in fire safety. In case of a fire, each member of the household should know how to get out of the house safely.

The first step in developing a fire escape plan is to survey the inside and outside of the home. Take notes of all the trees, windows, bushes, hallways, and doors. Next, draw a floor plan of the house that includes all windows, doors, and hallways.

Figure 1.2 - Floor Plan Showing Escape Routes



After drawing the floor plan, decide which is the best way to escape from each room. The plan should also include an alternate escape route, in case the first route cannot be used.

The plan should also include a location to meet family members in case of a fire. The meeting place may be near a tree or at the end of the driveway. Your home address, your neighbor's address, and phone number of the fire department should also be on the plan.

The last step is to practice the plan. Most fires happen at night when people are asleep; and when awakened, they are often drowsy. Practicing the plan will help make it easier to remember.

If a fire starts in the middle of the night, there are several steps that should be taken. First, roll out of bed onto the floor and crawl to the escape route. Do not stand up as smoke and heat rise. Use the planned first choice escape route. If that is not possible, use the second alternative. Get outside as quick as possible and move to the meeting place for a head count. After everyone has been accounted for, send someone to the nearest phone to call the fire department. Seconds count in a fire escape plan. Do not delay. A well-conceived plan can save a life.

Summary

Fires can destroy people's lives and their property. There are several types of fires. Fire extinguishers have been developed for use on each type of fire. Extinguishers should be maintained to ensure that they will function properly when needed. Fire warning systems should be installed in homes to detect heat and/or smoke caused by fires. Each household should develop and practice a plan for escaping the home in case of fire.

Lesson 2:
Electrical Energy and Safety

The discovery of electricity changed the world. The many uses of electricity make everyday life much easier. Electricity is used to power heating and cooling systems. It helps cook food or keep it cold. Electricity helps entertain people and saves lives through specialized medical equipment. Without electricity, life would be much harder. This lesson is about the unseen power source people often take for granted.

Defining Electricity

What is electricity? Electricity is a form of energy caused by the movement of electrons through a conductor. This flow of electrons is known as an electric current. Electric current that is controlled and directed can be used to produce forms of heat, light, and power.

Generating Electricity

There are several ways to generate electricity. The method most commonly used depends on the surrounding environment. For example, a hydroelectric generating plant requires a large amount of water. Dams are built on rivers for hydroelectric generating plants. Solar energy is more feasible in areas that receive large amounts of intense sunlight throughout the year.

Other techniques for generating power for electricity production include steam power, burning fossil fuels, or nuclear power. Geothermal power uses the hot water or steam from beneath the ground surface. Burning waste, wind power, batteries, and internal combustion engines are also used to generate electricity.

Electricity is produced at a generating power plant and transported to substations. It is then distributed through conductors, or distribution lines, to customers. Electrical distribution lines can either be attached to overhead poles or buried underground.

Measuring Electricity

Although electricity is an invisible source of power, it can be measured. Each month, electric companies read meters attached to homes and buildings to determine how much electricity has been used. Electricity use is measured in units called kilowatt-hours. Each time a light is turned on or a television or radio is used, electricity passes through the meter and its use is recorded. The more appliances a household operates, the more electricity is used.

Fuses

When electricity is transported to individual homes through distribution lines, the electrical power (i.e., voltage) must be reduced for it to be safely used at the home. However, electrical equipment must be installed to protect circuits from being overloaded. Fuses and circuit breakers are two methods of over-current protection.

Fuses are devices that prevent too much electrical current from flowing into a circuit. There are common plug fuses, tamper-resistant fuses, and cartridge fuses. Each type contains a metal strip that melts and breaks the circuit when excess current flows into the circuit.

Circuits that are not properly fused may become overloaded and cause a fire from the overheated wire and/or burning insulation. If there is an overload or electrical short problem in a circuit, the fuse would blow. This stops the flow of current to that specific area before it overheats

Figure 2.1 - Meter that Measures Electricity

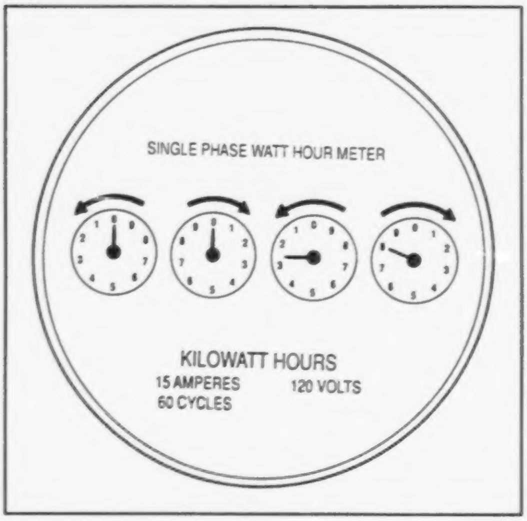
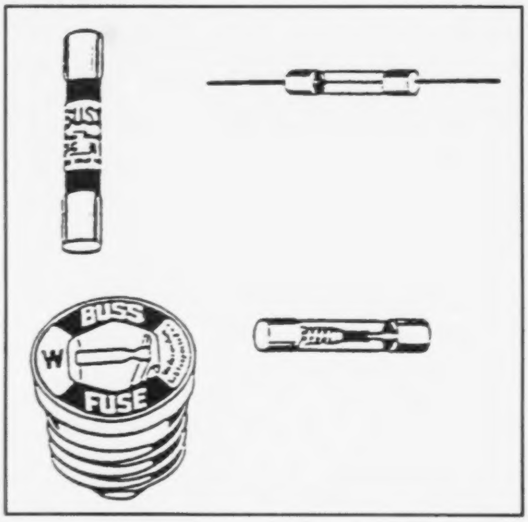


Figure 2.2 - Fuses



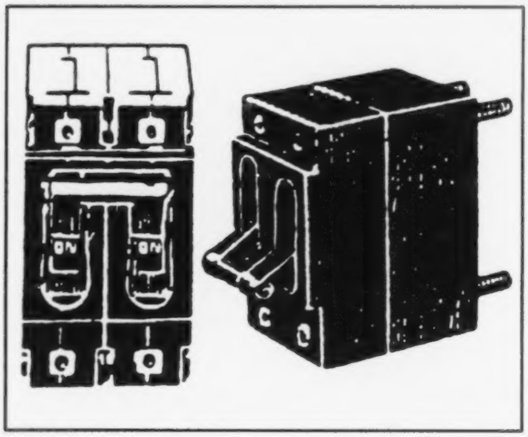
the system. A new fuse must be installed before service can be restored to the circuit. Without safety devices to disrupt the flow of current, the continued flow of electricity could heat up the wire to a point of causing a fire. Oversized fuses should never be used to replace a blown fuse. To do so would override the safety factors provided by a fuse of the proper size.

Circuit Breakers

Circuit breakers serve the same purpose as fuses. A circuit breaker is a switch that will trip when excess current passes through it. If a problem arises in an electrical circuit protected by circuit breakers, the breaker will trip and shut down the current flow. Repairing the circuit requires that the circuit breaker be reset. If the circuit breaker continues to trip, it is a sign that there is an electrical problem. The circuit must be repaired before resetting the circuit breaker. Unlike fuses, circuit breakers do not need to be replaced after they disrupt the circuit.

Today, all new construction has specific safety building codes for electric system installations. A GFCI receptacle, known as a Ground Fault Circuit Interrupter, must be installed anywhere in a home that has a water source near an electrical receptacle. Bathrooms and outside receptacles need GFCI receptacles installed. A GFCI is a more sensitive circuit breaker that is used around water sources to prevent electrical shocks.

Figure 2.3 - Circuit Breakers



Incandescent and Fluorescent Light Bulbs

There are two major types of lighting used in homes today. Incandescent lighting is the most common type. Incandescent lighting works by electric current traveling through the filament in the bulb. The current heats up a filament wire inside the bulb and produces light.

A fluorescent tube has more parts than an incandescent bulb. Fluorescent tubes can be long and straight or circular in shape. In fluorescent lights, the glass tube is coated on the inside with a material that glows when the gases trapped inside the tube are charged with an electrical current.

Fluorescent lighting has gained in popularity for home lighting as compared to incandescent lighting. Fluorescent lighting is more efficient, (more light per watt) less expensive, produces less heat, and is more suited for recessed lighting. Fluorescent bulbs or tubes are available in a variety of colors. Fluorescent bulbs or tubes also last longer than incandescent bulbs.

Safety

There are two primary hazards associated with electricity. There is the danger of electrical shock and of fire. Following safety precautions is important when dealing with electricity.

Summary

Electricity is a source of power used to operate appliances, tools, etc. Life is much more enjoyable because of electricity. Several methods of generating electricity have been developed. Fuses and circuit breakers are used to protect circuits from excess current. Electricity is used to power both incandescent and fluorescent lighting systems. Following safety precautions will reduce the shock and fire hazards associated with electricity.

Lesson 3:
Helping Homes Conserve Natural Resources

Resources Used in Homes

Early in this nation's history, households depended on wood to heat homes and cook food. Oil lamps or candles were used to provide light after sundown. Water was collected in pails from a nearby well or stream and hand carried into the house. Toilet facilities involved an "outhouse," usually located out behind the house.

Today, households in the U.S. utilize a variety of resources. These resources have enabled persons to enjoy a higher standard of living. Electricity has helped provide many of the comforts which are now taken for granted.

Water is another major resource used in homes. Pioneers hand carried water to be used in the home. Water pipes now provide water from faucets in several locations throughout most households. Natural gas and other types of fuel including fuel oil, butane, and propane are also commonly used resources in many homes. These materials are used to provide a source of heat for many activities performed in the home. Use of these fuels has decreased dependence on the use of coal and wood as heat sources.

Use of Resources

Electricity is important in the operation of many things in the home. Radios, lights, stoves, air conditioners, and televisions usually use electrical power. Dishwashers, washing machines, and clothes dryers are also common appliances which run on electricity. Many of the jobs that people in the past performed by hand are now much easier with the aid of electricity.

Electricity is not the only source of power for appliances in our homes; natural gas is another. Natural gas is considered one of the cleanest and most perfect fuels. At one time, natural gas was considered to be a waste product from oil fields. Many oil fields would "burn off" this excess gas. After it has been removed from the ground, natural gas is processed to remove impurities such as water, dust, and sulfur. The natural gas is then transferred into a pipeline where it is distributed to consumers. Natural gas is commonly used in home furnaces, water heaters, and clothes dryers.

Fuel oil is another source for heating homes. The type of fuel oil usually used to heat homes is a No. 2 grade diesel fuel. Diesel fuel is also used to operate diesel engines in trucks, farm tractors, cars, and construction equipment. Gasoline is also used to fuel vehicles. Propane is another type of fuel that is processed from crude oil. Propane is usually bottled in pressurized steel tanks and used for gas barbecue grills and in motor homes.

Water is another resource commonly used in the home. Water towers are common sites in towns throughout the U.S. Water is provided to most homes through a network of underground pipes. Home uses of water include drinking, cooking, bathing, and washing clothes. Other ways in which water is used around the home include watering lawns and gardens, washing cars, operating toilets, and brushing teeth.

Water is a precious commodity. Supplies of water have become contaminated in some areas. Purification systems have been installed in many communities to ensure that water supplies are safe to drink. Water quality is becoming an important issue in many states.

Conserving Resources in the Home

Resources are wasted in the home when they are used needlessly. It is important to recognize how resources are wasted and what steps can be taken to conserve resources. Electricity can be wasted by operating lights or appliances inefficiently. People should get in the habit of turning off the lights in rooms that are unoccupied. Heating and air conditioning equipment should be adjusted to conserve resources during times when the home is unoccupied. Furnace thermostats could be set at 72°F during the day but can be lowered at night while people are sleeping. Air conditioning thermostats should be set at 78°F or higher.

Insulation should be installed in walls, ceilings, attics, and around doors, windows, and hot water heaters. Insulation helps to keep houses warmer in the winter and cooler in the summer. Insulation blankets around hot water heater allow the heater to operate more efficiently.

The first step in correcting resource waste is to locate where the resource loss is occurring. Air loss can occur around doors, windows, and through cracks in walls.

Caulking can be applied to all exterior cracks and joints and around door and window frames to reduce drafts. Air leaks can also be stopped by using weatherstripping around doors and windows. Windows and doors should be kept tightly closed during the heating and cooling seasons. Each of these steps will reduce the amount of electricity used in the home.

Faulty or inefficient plumbing fixtures consume more water than necessary. A dripping faucet in the home can increase the water bill by several dollars over the course of a year. A leaky hot water faucet results in higher water bills in addition to the cost of heating the water. Repairing a leaky toilet, taking shorter showers, and washing only full loads of clothes are other ways to reduce water use in the home.

There are many other ways to help conserve resources in the home. Each person in the household should do his or her part to reduce resource use. Wise use of resources also has the added benefit of lower utility bills.

Summary

The U.S. has less than five percent of the world's population, yet it uses almost one-third of the world's energy. Residential homes and commercial buildings use energy sources for lighting, heating, cooling, and to operate appliances and tools. As buildings are made more energy-efficient and people become more resource conscious, a great deal of resources will be saved.

Lesson 4:
Home Maintenance Tool Kit

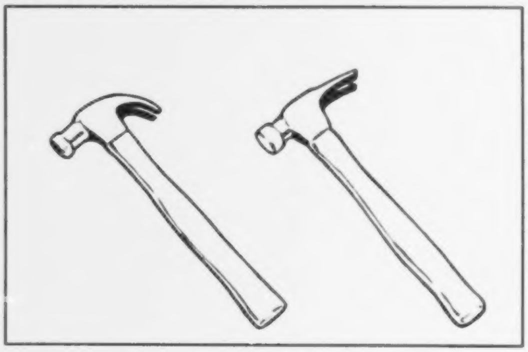
Most homes have a drawer or a box to store tools. Common household tools include screwdrivers, pliers, wrenches, hammers, handsaws, and measuring tapes. Some homes have a place either in the garage, shop, or tool shed set aside to work on projects. Most tools found in homes are hand tools made for specific jobs. This lesson is about common hand tools used in the home.

Common Hand Tools

Almost everyone has used a hand tool of some kind. The most common tools are hammers, screwdrivers, handsaws, pliers, wrenches, and measuring tapes. Each of these tools are designed for a specific purpose.

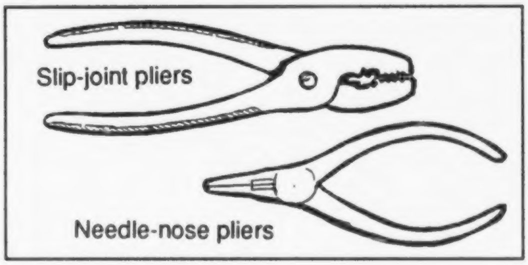
Hammers - Claw hammers are mainly used for hobbies, cabinet making, finish carpentry, and framing work. Hammers are commonly used to drive nails into wood. They can also be used to remove nails. Hammers are frequently used to pound or move objects that are difficult to move by hand. Claw hammers may have a wood, fiberglass, or steel handle.

Figure 4.1 - Common Hammers



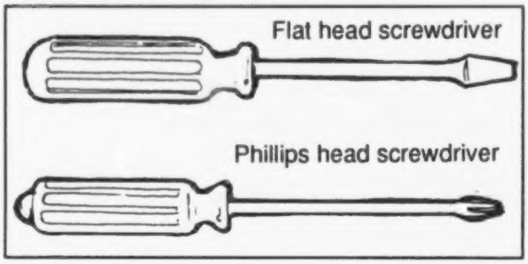
Pliers - Pliers vary in size and use. Slip-joint and needle-nose pliers are the most common types used in the home. They can be used for a variety of jobs but are commonly used to grip or turn objects. Slip-joint pliers can be enlarged to grip larger objects. The needle-nose pliers can be used to reach into small areas and grip small objects such as wire.

Figure 4.2 - Common Pliers


Slip-joint pliers
Needle-nose pliers

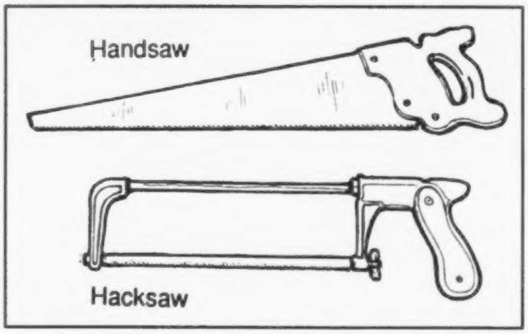
Screwdrivers - Screwdrivers come with either a flat head or Phillips® head. Screwdrivers should be selected according to the size of screw being used. Large screwdrivers do not fit in the slot of small screws. Using a screwdriver that is too small can strip the head of a large screw.

Figure 4.3 - Common Screwdrivers


Flat head screwdriver
Phillips head screwdriver

Handsaws - There are several types of handsaws. Some tool kits will contain a handsaw for cutting wood. Some kits will also contain a hacksaw for cutting metal or plastic materials.

Figure 4.4 - Handsaws


Handsaw
Hacksaw

Wrenches - Wrenches are used to tighten or loosen nuts and bolts. Combination wrenches have both an open end and a box end on each tool. They come in different sizes such as 9/16", 3/4", and 7/8". Socket wrenches are metal tubes that are attached to a ratchet, which can be used to turn a hex head nut or bolt.

Figure 4.5 - Wrenches

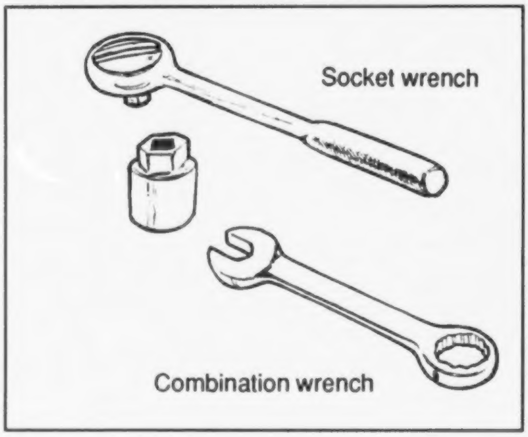
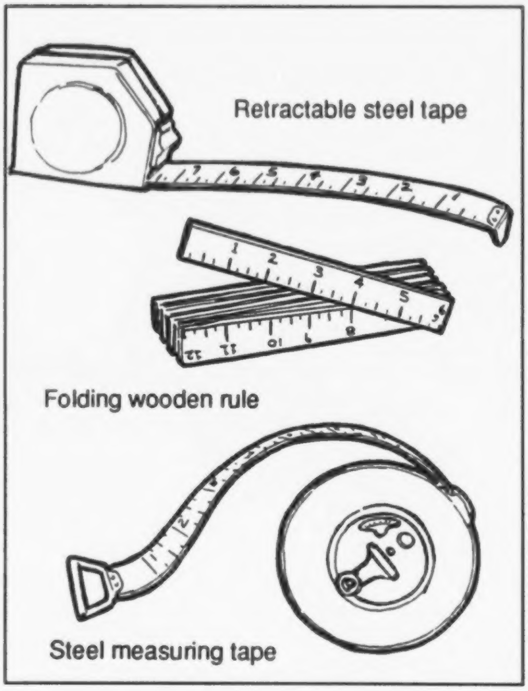

Socket wrench
Combination wrench

Figure 4.6 - Measuring Tools


Retractable steel tape
Folding wooden rule
Steel measuring tape

Measuring Tools - Common measuring tools are retractable steel tapes, wooden folding rules, and steel measuring tapes. Retractable steel tapes vary in length from 6 feet to 25 feet. Steel measuring tapes vary in length from 25 feet to 100 feet. Wooden folding rules generally come in 6-foot lengths.

Tool Safety

Safety is very important when using hand tools. Always wear safety glasses. Always use the proper tool for the job. Each tool is designed for a specific job. Do not to use a tool for a job it was not designed to do.

Sometimes tools need to be repaired. Always inspect the tool before use. Using a damaged or broken tool can cause an accident or injury. Tools should be kept clean and free of dirt, grease, and rust.

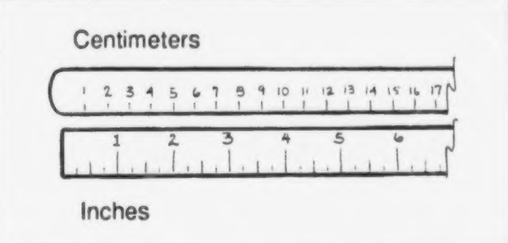
Tools should be stored in a properly marked place that is clean and safe. Store sharp-edged or pointed tools with the cutting edges pointing down and away from the work area. Sharpen blades and cutting edges to avoid the need for excessive force when using the tool. Dull cutting tools are dangerous to use. Careless conduct when using tools can lead to serious injury. Think safety and act safely for yourself and others around you.

Measuring Units

There are two common systems of measure. The English system of measure is most often used in the U.S. The English system uses measurement units of yards, feet, and inches. Square yards, square feet, and board feet are calculated using this system.

The second system is the metric scale. The units in the metric scale are meters, centimeters, and millimeters. One meter is equal to 39.37 inches, which is slightly more than one yard.

Figure 4.7 - Measuring Units



Summary

Knowing what tools to use and how to use them safely is very helpful in many households. Hand tools are designed to perform certain tasks. Using the correct tool for a job is very important. Maintaining and storing tools properly will help ensure they are safe to use when needed. Measuring tools are helpful when calculating areas or distances for household projects.

Credits

Fire Extinguishers: Your Small-Fire Defense. Quincy, MA: National Fire Protection Association.

Henderson, G.E.; Robert H. Brown. Home Electrical Repair. 6th ed. Athens, GA: American Association for Vocational Instructional Materials, 1987.

Henderson, G.E. Understanding Electricity and Electrical Terms. 6th ed. Athens, GA: American Association for Vocational Instructional Materials, 1986.

Play It Safe--Plan Your Escape. Quincy, MA: National Fire Protection Association.

Solar Energy Applications for Agriculture, A Curriculum Guide. Lincoln, NE: Department of Agricultural Education, University of Nebraska-Lincoln, n.d.

Understanding Electricity and Electricity Terms, 80 slides with script. Athens, GA: American Association for Vocational Instructional Materials.

University Extension: University of Missouri-Columbia

- a. EN8: Energy, Dollars and Sense of Conservation, Glossary of Terms
- b. EN2: Energy, Dollars and Sense of Conservation, Why Energy Conservation?
- c. EN29: Energy, Dollars and Sense of Conservation, Weather Stripping Windows
- d. EN28: Energy, Dollars and Sense of Conservation, Weather Stripping Doors

Your House is on Fire. Aetna Life and Casualty, Booklet.